52—13

Proceedings of the American Academy of Arts and Sciences.

Vol. 52. No. 13. — October, 1917.

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VOLUME 52.

Proceedings of the American Academy of Arts and Sciences.

VOL. 52. NO. 13. — OCTOBER, 1917.

(TITLE PAGE AND TABLE OF CONTENTS.)

RECORDS OF MEETINGS.

One thousand and fifty-eighth Meeting.

OCTOBER 11, 1916.— STATED MEETING.

The Academy met at its House.

The PRESIDENT in the Chair.

There were fifty-two Fellows and two guests present:—

The following letters were presented by the Corresponding Secretary: from J. W. Baird, W. B. Clark, L. H. Gray, A. B. Hart, Ellsworth Huntington, C. K. Leith, F. T. Lewis, W. A. Setchell, P. G. Stiles, W. C. Sturgis, accepting Fellowship; from Thomas Hardy, accepting Foreign Honorary Membership.

The Chair announced the deaths of the following Fellows and Foreign Honorary Members: Emory McClintock, Class I., Section 1; Eugene Waldemar Hilgard, Class I., Section 3; Josiah Royce, Class III., Section 1; Elie Metchnikoff, Class II., Section 3; Sir Victor A. H. Horsley, Class II., Section 4; Sir Thomas Lauder Brunton, Class II., Section 4; Arthur Sampson Napier, Class III., Section 2.

The Corresponding Secretary announced the receipt of biographical notices of deceased Fellows, as follows:— Class I., Erasmus Darwin Leavitt, by G. R. Agassiz; Simon Newcomb, by E. W. Brown; Sir Henry Roscoe, by Ira Remsen; William Thomson, Lord Kelvin, by Elihu Thomson; Class II., Thomas Jonathan Burrill, by W. G. Farlow; George Edward Davenport, by F. S. Collins, Sir Michael Foster, by Alexander Forbes, Class III., Melville Weston Fuller, by Moorfield Storey.

On the recommendation of the Council, it was

Voted, To appropriate three hundred ($300) dollars from the income of the General Fund for Library expenses, and two hundred ($200) dollars for the use of the Publication Committee in printing biographical notices of deceased Members in the Proceedings.

The following communication was presented: Professor Alfred G. Mayer, "On the Races of the Pacific."

On motion of the President, the thanks of the Academy were unanimously voted to Professor Mayer for his communication.

The meeting then adjourned.

One thousand and fifty-ninth Meeting.

NOVEMBER 15, 1916.— STATED MEETING.

The Academy met at its House.

The PRESIDENT in the Chair.

There were eighty-three Fellows present:—

The Rumford Medals were presented to Dr. Charles Greeley Abbot for his researches in Solar Radiation.

Dr. Abbot addressed the Academy on "The Heat of the Sun." The communication was illustrated by lantern slides.

The following paper was presented by title: "Natural and Isogonal Families of Curves on a Surface," by Joseph Lipka. Presented by H. W. Tyler.

The meeting then adjourned.

One thousand and sixtieth Meeting.

DECEMBER 13, 1916.— STATED MEETING.

The Academy met at its House.

VICE-PRESIDENT THOMSON in the chair.

There were forty-nine Fellows present.

The following letters were presented by the Corresponding Secretary: from Wm. Trelease, president of the Illinois Academy of Science, inviting a representative of the Academy to be present at its tenth anniversary, on February 23 and 24, 1917; from the University of Illinois, an invitation to the dedication of its new Ceramic Engineering Building; from Dr. Vincent Y. Bowditch, enclosing a notice of the Academy meeting of May 25, 1825.

The following deaths were announced: Cleveland Abbe, Fellow in Class II., Section 1; Percival Lowell, Fellow in Class I., Section 1; Charles Pomeroy Parker, Fellow in Class III., Section 2;

Arthur Auwers, Foreign Honorary Member in Class I., Section 1.

The Corresponding Secretary announced the receipt by the Council of the following biographical notices of deceased Fellows: A. T. Cabot, by F. C. Shattuck, W. R. Ware, by H. L. Warren, Friedrich Kohlrausch, by A. L. Day, S. F. Emmons, by Waldemar Lindgren, L. P. di Cesnola, by Arthur Fairbanks.

On the recommendation of the Council, Professor Farlow was invited to represent the Academy at the tenth anniversary of the Illinois Academy of Science.

The presentation by Dr. B. L. Robinson, of a portrait print of the Kruell etching of Dr. Asa Gray, President of the Academy, 1863–73, was announced.

The following communications were presented:

Mr. Arthur Foote. "On the Composition of Music," with piano illustrations.

Professor Wm. M. Davis. "Sublacustrine Glacial Erosion of the Mission Range, Montana," illustrated by lantern slides.

The meeting then adjourned.

One thousand and sixty-first Meeting.

JANUARY 10, 1917.— STATED MEETING.

The Academy met at its House.

The PRESIDENT in the Chair.

There were forty-three Fellows and three guests present:

The Council reported that the Treasurer had caused the following advertisement of the Francis Amory Fund to be published, in accordance with the terms of the will, in the Boston Transcript and the Boston Daily Advertiser of December 30, 1916.

AMERICAN ACADEMY OF ARTS AND SCIENCES.

FRANCIS AMORY of Boston, who died on the tenth day of November, 1912, bequeathed to the American Academy of Arts and Sciences a sum of money for the purpose of establishing a Septennial Prize and a Gold Medal to encourage the invention and discovery of measures for the relief of maladies peculiar to the bladder and the various organs connected with it.

In default of such invention or discovery, the prize and medal may be awarded for any treatise of exceptional value upon the anatomy of these organs or upon the treatment of these diseases.

Mr. Amory directed that public notice should be given of the nature and design of the Fund, and that contributions should be expressly solicited in aid of it.

The attention of the public is therefore called to the existence of this Fund and contributions are hereby solicited.

Under the provisions of the will the Income of the Fund cannot be awarded until twenty-one years from the date of Mr. Amory's death.

HENRY H. EDES, *Treasurer.*

Boston, 10 November, 1916.

AMERICAN ACADEMY OF ARTS AND SCIENCES.

FRANCIS AMORY of Boston died on the tenth day of November, 1912. In satisfaction of the requirements of his last will and testament, duly proved and allowed as such, with certain modifications, in and by the Probate Court for the County of Suffolk in the Commonwealth of Massachusetts on the thirteenth day of March, 1914, the following detailed and itemized account of the Fund bequeathed to the American Academy of Arts and Sciences, and of the administration and application thereof during the fiscal year 1915–16, is published in two of the principal newspapers printed in Boston.

FRANCIS AMORY FUND.

Received from the Estate of Francis Amory	$25,000.00
Less 10% as per Agreement of Compromise	2,500.00
	$22,500.00
Interest thereon to 31 July, 1915	517.50
On Investments	567.50
	$23,585.00
Investments made, as follows:	
$5,000 Mortgage on improved Real Estate in Boston at 5%	5,000.00
5,000 Chicago Junction Railway and Union Stock Yards Company 5% bonds	4,950.00
5,000 Western Electric Company 5% bonds	5,045.00
5,000 Western Telephone and Telegraph Company 5% bonds	4,808.75
3,000 New York Telephone Company 4½% bonds	2,876.25
Interest in adjustment	243.80
Paid Probate Office, for attested copy of Mr. Amory's will and the Agreement of Compromise	6.25
Balance of Cash on hand, uninvested	654.95
	$23,585.00

HENRY H. EDES, *Treasurer.*

Boston, 10 November, 1916

The following gentlemen were elected Fellows of the Academy:—

Edward Weston, of Newark, N. J., to be a Fellow in Class I., Section 2 (Physics).

James Walter Goldthwait, of Hanover, N. H., to be a Fellow in Class II., Section 1 (Geology, Mineralogy and Physics of the Globe).

Thomas Wayland Vaughan, of Washington, D. C., to be a Fellow in Class II., Section 1.

Joseph Augustine Cushman, of Sharon, to be a Fellow in Class II., Section 3 (Zoology and Physiology).

The following communications were presented:

Professor F. C. Shattuck, "On the Development of Medical Science."

Professor W. E. Story, "On Big Numbers."

The meeting then adjourned.

One thousand and sixty-second Meeting.

FEBRUARY 14, 1917.— STATED MEETING

The Academy met at its House.

The PRESIDENT in the Chair.

There were thirty-one Fellows present.

The following letters were presented by the Corresponding Secretary:— from Isaiah Bowman, T. W. Vaughan and J. A. Cushman, accepting Fellowship.

On recommendation of the Council, it was

Voted, To increase the subscription for the Union List of Periodicals from fifty ($50) dollars to seventy-five ($75) dollars.

The following communication was presented:

Professor W. T. Bovie, "The Effect of Rays on Protoplasm."

The meeting then adjourned.

One thousand and sixty-third Meeting.

MARCH 14, 1917.— STATED MEETING.

The Academy met at its House.

The PRESIDENT in the Chair.

There were fifty-three Fellows and eleven guests present.

The Corresponding Secretary announced the receipt of a biographical notice of Percival Lowell, by George R. Agassiz.

The Chair announced the death of Edward Dyer Peters, Fellow in Class I., Section 4.

The Chair appointed the following Councillors to act as Nominating Committee:

Desmond FitzGerald, of Class I.

John C. Warren, of Class II.

Mark A. DeW. Howe, of Class III.

On recommendation of the Council, the following appropriations were made for the ensuing year:—

From the income of the General Fund, $5400, to be used as follows:—

for General and Meeting expenses	$ 500.
for Library expenses	2000.
for Books, periodicals and binding	800.
for House expenses	1600.
for Treasurer's office	500.

From the income of the Publication Fund, $3000. to be used for publication.

From the income of the Rumford Fund, $2926.60 to be used as follows:—

for Research	$1000.
for Books, periodicals and binding	200.
for Publication	600.
for use at the discretion of the Committee	1126.60

From the Warren Fund, $1500. to be used at the discretion of the Committee.

The following communications were presented:—

Dr. Francis G. Benedict. "Human Energy and Food Requirements."

Dr. Arthur G. Webster. "Physics and War."

The following paper was presented by title:

"New Laboulbeniales, chiefly Dipterophilous American Species." By Roland Thaxter.

The meeting then adjourned.

One thousand and sixty-fourth Meeting.

APRIL 11, 1917.— STATED MEETING.

The Academy met at its House.

The PRESIDENT in the Chair.

There were twenty-six Fellows and two guests present:

The following letters were presented by the Corresponding Secretary:— from J. W. Goldthwait, accepting election to the Academy; from A. S. Hardy, declining Fellowship.

The Corresponding Secretary announced the recepit of three biographical notices: James Clarke White and Sir Thomas Lauder Brunton, by F. C. Shattuck; Cleveland Abbe, by R. DeC. Ward.

The following communication was presented:

Professor W. J. V. Osterhout, "The Relation of Life-processes to the Permeability of Protoplasm."

The meeting then adjourned.

One thousand and sixty-fifth Meeting.

MAY 9, 1917.— ANNUAL MEETING.

The Academy met at its House.

The PRESIDENT in the Chair.

There were thirty-four Fellows present.

The Corresponding Secretary presented a letter from J. L. Bremer, accepting Fellowship. The following biographical notices were also presented: William Watson, by C. R. Cross; D. I. Mendeléeff, by G. S. Forbes.

The following report of the Council was presented:—

Since the last report of the Council, there have been reported the deaths of seven Fellows: Emory McClintock, Eugene Waldemar Hilgard, Josiah Royce, Cleveland Abbe, Percival Lowell, Charles Pomeroy Parker, Edward Dyer Peters; and of five Foreign Honorary Members: Arthur Auwers, Elie Metchnikoff, Sir Victor A. H. Horsley, Sir Thomas Lauder Brunton, Arthur Sampson Napier.

Seventeen Fellows have been elected, of which number one has declined Fellowship, one has not yet accepted. Dr. Alexis Carrel elected in 1914, has not yet accepted.

One Foreign Honorary Member has been elected. Four previously elected, have not yet accepted.

The roll now includes 484 Fellows and 62 Foreign Honorary Members.

The annual report of the Treasurer was read, of which the following is an abstract:—

GENERAL FUND.

Receipts.

Balance, April 1, 1916	$2,259.60	
Investments	3,520.00	
Assessments	3,290.00	
Admissions	140.00	
Sundries	152.21	$9,361.81

Expenditures.

Expense of Library	$2,301.44	
Expense of House	1,810.71	
Treasurer	404.29	
General Expense of Society	345.84	
Printing Biog. Notices in Proc. 51	200.00	
Interest on Bonds bought	3.78	
Income transferred to principal	265.13	$5,331.19
Balance, April 1, 1917		4,030.62
		$9,361.81

RUMFORD FUND.

Receipts.

Balance, April 1, 1916	$3,146.56	
Investments	3,164.27	
Grant returned	100.00	6,410.83

Expenditures.

Research	$2,519.88	
Books, periodicals and binding	72.94	
Publication	1,347.12	
Sundries	38.60	
Interest on Mortgage, bought	7.64	
Income transferred to principal	154.03	$4,140.21
Balance, April 1, 1917		2,270.62
		$6,410.83

C. M. Warren Fund.

Receipts.

Balance, April 1, 1916	$1,902.23	
Investments	2,000.73	3,902.96

Expenditures.

Research	$1,277.00	
Sundries	3.00	
Interest on Mortgage, bought	.77	
Income transferred to principal	29.92	$1,310.69
Balance April 1, 1917		$2,592.27
		$3,902.96

Publication Fund.

Receipts.

Balance, April 1, 1916	$1,456.95	
Appleton Fund investments	907.26	
Centennial Fund investments	2,384.27	
Author's Reprints	179.00	
Sale of Publications	164.05	$5,091.53

Expenditures.

Publications	$2,995.31	
Sundries	10.00	
Interest on Mortgage, bought	4.96	
Income transferred to principal	159.43	$3,169.70
Balance, April 1, 1917		$1,921.83
		$5,091.53

Francis Amory Fund.

Receipts.

Investments	$1,178.75	$1,178.75

Expenditures.

Interest on Bonds and Mortgage, bought	13.26	
Sundries	38.08	
Income transferred to principal	1,127.41	$1,178.75

The following reports were also presented:—

REPORT OF THE LIBRARY COMMITTEE.

The Librarian begs to submit the following report:—

During the year, 71 books have been borrowed from the Library by 24 persons including 16 Fellows and 2 libraries. Although no actual count has been kept, about 75 people have made use of the reading-room, consulting about 150 volumes. All books taken out have been satisfactorily accounted for.

The number of volumes on the shelves at the time of the last report was 34,681. 547 volumes have been added during the past year, making the number now on the shelves, 35,228. This includes 25 purchased from the income of the General Fund, 18 from that of the Rumford Fund, and 504 received by gift or exchange. The pamphlets added during the year number 1276.

The number of gifts of books and pamphlets was greatly augmented this year in response to the request for the publications of Fellows, sent out in November, 1916. It is hoped that still more of such publications may be received.

The expenses charged to the Library during the financial year are:—

Salaries	$1,785.87
Binding:—	
General Fund	371.90
Rumford Fund	36.40
Purchase of periodicals and books:—	
General Fund	120.68
Rumford Fund	36.54
Miscellaneous	26.56
Total	$2,377.95

While we have unfortunately been deprived through an illness of several months of the services of the assistant Librarian, Mrs. Holden, the Librarian takes pleasure in commending the manner in which the work has been carried on by Mrs. A. M. Smith.

A. G. WEBSTER, *Librarian.*

May 9, 1917.

Report of the Rumford Committee.

The Committee organized Oct. 11, 1916, choosing Messrs. Charles R. Cross, Chairman and Arthur G. Webster, Secretary.

During the present year, grants have been made in aid of research as fellows:—

October 11, 1916. To Professor J. A. Parkhurst in aid of his investigations on the determination of the Photometric scale of stellar magnitude $300

Dec. 13, 1916. To Mr. E. T. King in aid of his researches on physical measurements of the color of pigments 25

To Professor Edward Kremers in aid of his research on the chemical action of light on organic compounds 300

Feb. 14, 1917. To Professor F. K. Richtmyer in aid of his research on the optical properties of thin films 500

To Professor Norton A. Kent in aid of his research on spectral lines. (Additional) 400

To Mr. Ancel St. John in aid of his research on the spectra of X-rays 200

May 9, 1917. To Mr. David L. Webster, for the salary of an assistant in connection with his research on the intensity of lines in X-ray spectra 100

To Professor Frederic Palmer Jr. in aid of his research on light of very short wave length. (Additional) 100

To Professor B. J. Spence in aid of his research upon a new Color Identity Pyrometer 75

To Professor B. J. Spence in aid of his research upon a new and more sensitive form of radiometer 150

To Professor R. C. Gibbs, in aid of his investigations on the absorption of organic and other solutions for ultra-violet, visible and infra-red rays 500

To Professor W. M. Baldwin in aid of his research on the character of chemical substances necessary to sensitize animal tissues to the influence of X-rays 125

Voted to refer to the Chairman the question of the award of $150 to Mr. Preston H. Edwards in aid of his research on solar radiation in India with power to act.

Mr. Everett T. King who, as already stated, received a grant on Dec. 13, 1916, to aid in the prosecution of a research on which he was then engaged, was shortly thereafter attacked with typhoid fever

which resulted fatally. It is worthy of remark that Mr. King was the youngest person to whom a grant from the Rumford Fund has ever been made.

Reports of progress in their several researches have been received from the following persons:—

Messrs. C. G. Abbot, R. T. Birge, P. W. Bridgman, W. W. Campbell, A. L. Clark, H. Crew, F. Daniels, E. B. Frost, H. C. Hayes, H. P. Hollnagel, L. R. Ingersoll, N. A. Kent, F. E. Kester, L. V. King, C. A. Kraus, E. Kremers, G. M. Lewis (research finished), R. A. Millikan, C. L. Norton, F. Palmer, Jr., J. A. Parkhurst, H. M. Randall, T. W. Richards, F. K. Richtmyer, A. St. John, F. A. Saunders, W. O. Sawtelle, A. W. Smith, F. W. Very.

The following papers have been published with aid from the Rumford Fund in the Proceedings of the Academy, Vol. 52, since the last annual meeting.

No. 2. July 1916. The velocity of polymorphic changes between solids by P. W. Bridgman.

No. 3. July 1916. Polymorphism at high pressures, by P. W. Bridgman.

No. 9. Feb. 1917. The electrical resistance of metals under pressure by P. W. Bridgman.

No. 12. Due to appear shortly, the Joule-Thomson effect in superheated steam. I. An experimental study of heat leakage by H. M. Trueblood.

At its meeting of Feb. 14th, 1917, the Committee voted that the replica of the first Rumford Medal which, according to a previous vote, is to be presented to the Rumford Historical Society shall be of silver rather than of bronze.

It having occasionally occurred, especially in summer when the Committee is scattered, that important applications have been received for aid which could not be met in the usual manner, the Committee has endeavored to meet this exigency as indicated in the following action of Dec. 13, 1916: Voted: that in case of immediate need of an appropriation the chairman be authorized to communicate the case in writing to the members and, on receiving the written consent of a majority of the Committee, may make the appropriations thus authorized; provided that in case any member of the Committee presents serious objections and so requests the matter shall be reserved and presented to the Committee at their next regular meeting.

At the meeting of March 14, 1917, it was unanimously voted for the first time and at the meeting of April 11th, for the second time to

recommend to the Academy that the Rumford Premium be awarded to Percy W. Bridgman for his Thermodynamical Researches at extremely high Pressures.

CHARLES R. CROSS, *Chairman.*

May 9, 1917.

REPORT OF THE C. M. WARREN COMMITTEE.

The C. M. Warren Committee begs to submit the following report:

The unexpended balance of appropriations held by the Committee at the time of the last report was $1201.50. In March, 1917, a further appropriation of $1500 was made by the Academy.

During the past year the sum of $30 has been expended for reprinting of certain papers by Professor Charles F. Mabery, copies of which had been exhausted.

On December 14, 1916, a grant of $250 was made to Professor E. L. Mark to assist in carrying on an investigation of certain properties of sea water at the Bermuda Islands. This carried with it the understanding that so much of the apparatus purchased from this grant as might be of a permanent character should be considered the property of the Academy and subject to its directions at the close of the investigation.

On January 15, 1917, an additional grant of $150 was made to Professor R. F. Brunel for the purchase of chemicals needed for the continuation of his research on the relation between the constitution of aliphatic radicals and their chemical affinities.

The amount which remains at the disposal of the Committee at the present time is $2271.50. This sum, of course, is exceptionally large, and under ordinary conditions it would undoubtedly be wise to consider the investment of a part of this sum as an addition to the permanent fund. The Committee is of the opinion, however, that under the present conditions it is better to hold this sum in readiness for its possible use to promote researches which are necessary in connection with our national crisis.

During the past year Professor W. D. Harkins has published additional papers on Surface Energy in the March and April numbers of the Journal of the American Chemical Society.

Professor R. F. Brunel has also published results of research work aided by a grant from the Warren Fund on the "Reversible Replace-

ment of Alcohols in Aldehydealcoholates," which appeared in the Journal of the American Chemical Society in September, 1916.

Respectfully submitted,

H. P. TALBOT, *Chairman.*

May 9, 1917.

REPORT OF THE PUBLICATION COMMITTEE.

The Committee of Publication submits the following report for the period from April 1, 1916 to April 1, 1917.

During this period, 1070 pages of the Proceedings have been issued, namely Nos. 11–14 of Vol. 51, and Nos. 1–9, of Vol. 52.

Several of these numbers, namely 51:12, 52:2, 52:3, 52:9, and part of 51:13, were paid for out of the funds of the Rumford Committee, the total charge against the Rumford Fund being $1324.39.

The accounts of the Committee of Publication stand as follows:

Balance on hand April 1, 1916	$1,408.55
Appropriation for 1916–1917	3,000.00
Additional appropriation, to cover the cost of 90 pages of biographical notices	200.00
Proceeds from the sale of publications	164.05
Total available funds	4,772.60
Expenses	3,016.31
Balance on hand April 1, 1917	$1,756.29

During the present year, authors have ordered "extra" reprints, through the Committee, to the amount of $179.00.

Respectfully submitted,

EDWARD V. HUNTINGTON, *Chairman.*

May 9, 1917.

REPORT OF THE HOUSE COMMITTEE.

The House Committee submits the following report for the year 1916–17.

The Committee had at its disposal at the beginning of the year a

balance of $360.33. The appropriation by the Academy for the year was $1600, and there has been received for the use of the rooms,— from the Harvard-Technology Chemical Club $18, from the Colonial Society $15, from the Archaeological Society $5, from sale of chairs $4.25, making the total amount at the disposal of the committee $2002.58.

The total expenditure for the year was $1861.34, leaving at the close of the fiscal year an unexpended balance of $141.24. The expenditures may be summarized as follows:

Janitor		$750.00
Electricity	A. Light	64.00
	B. Power	44.00
Gas		11.04
Water		8.00
Telephone		50.95
Coal	Furnace	409.63
	Water Heater	45.50
Ash tickets		7.00
Care of elevator		21.46
Ice		14.40
Janitor's materials		16.72
Furnishings		228.62
Upkeep		188.02
Sundries		2.00
Total expenditure		$1,861.34

Meetings have been held as follows:—

American Academy of Arts and Sciences	8
Harvard Biblical Club	6
Harvard-Technology Chemical Club	2
Colonial Society	4
American Antiquarian Society	1
Archaeological Institute of America	1

American Oriental Society held two all day sessions April 10 and 11, and one evening session, April 10.

Respectfully submitted,

HAMMOND V. HAYES, *Chairman.*

May 9, 1917.

On recommendation of the Rumford Committee, it was

Voted, To award Rumford Premium to Percy Williams Bridgman, of Cambridge, Mass., for his Thermodynamical Researches at Extremely High Pressures.

The annual election resulted in the choice of the following officers and committees:—

CHARLES P. BOWDITCH, *President.*
ELIHU THOMSON, *Vice-President for Class I.*
WILLIAM M. DAVIS, *Vice-President for Class II.*
GEORGE F. MOORE, *Vice-President for Class III.*
HARRY W. TYLER, *Corresponding Secretary.*
WM. STURGIS BIGELOW, *Recording Secretary.*
HENRY H. EDES, *Treasurer.*
ARTHUR G. WEBSTER, *Librarian.*

Councillors for Four Years.

HENRY LEFAVOUR, *of Class I.*
WILLIAM T. SEDGWICK, *of Class II.*
BARRETT WENDELL, *of Class III.*

Finance Committee.

HENRY P. WALCOTT, JOHN TROWBRIDGE,
GEORGE V. LEVERETT.

Rumford Committee.

CHARLES R. CROSS, ARTHUR G. WEBSTER,
EDWARD C. PICKERING, ARTHUR A. NOYES,
LOUIS BELL, ELIHU THOMSON,
THEODORE LYMAN.

C. M. Warren Committee.

HENRY P. TALBOT, CHARLES L. JACKSON,
WALTER L. JENNINGS, ARTHUR D. LITTLE,
ARTHUR A. NOYES, GREGORY P. BAXTER,
WILLIAM H. WALKER.

Publication Committee.

EDWARD V. HUNTINGTON, *of Class I.*
WALTER B. CANNON, *of Class II.*
ALBERT A. HOWARD, *of Class III.*

Library Committee.

HARRY M. GOODWIN, *of Class I.*
THOMAS BARBOUR, *of Class II.*
WILLIAM C. LANE, *of Class III.*

House Committee.

GEORGE T. AGASSIZ, LOUIS DERR,
WM. STURGIS BIGELOW.

Committee on Meetings.

THE PRESIDENT, WILLIAM M. DAVIS,
THE RECORDING SECRETARY, EDWIN B. WILSON,
GEORGE F. MOORE.

Auditing Committee.

GEORGE R. AGASSIZ, JOHN E. THAYER.

The following gentlemen were elected Fellows of the Academy:—

Raymond Clare Archibald, of Providence, to be a Fellow in Class I., Section 1.

Frank Morley, of Baltimore, to be a Fellow in Class I., Section 1.

Frederick Slocum, of Middletown, to be a Fellow in Class I., Section 1.

Gordon Ferrie Hull, of Hanover, to be a Fellow in Class I., Section 2.

John Zeleny, of New Haven, to be a Fellow in Class I., Section 2.

Bernard Arthur Behrend, of Boston, to be a Fellow in Class I., Section 4.

Charles Francis Brush, of Cleveland, to be a Fellow in Class I., Section 4.

Herbert Ernest Gregory, of New Haven, to be a Fellow in Class II., Section 1.

John Duer Irving, of New Haven, to be a Fellow in Class II., Section 1.

Frederic Brewster Loomis, of Amherst, to be a Fellow in Class II., Section 1.

Alexander George McAdie, of Readville, to be a Fellow in Class II., Section 1.

William John Miller, of Northampton, to be a Fellow in Class II., Section 1.

Louis Valentine Pirsson, of New Haven, to be a Fellow in Class II., Section 1.

Percy Edward Raymond, of Cambridge, to be a Fellow in Class II., Section 1.

William North Rice, of Middletown, to be a Fellow in Class II., Section 1.

Charles Willison Johnson, of Boston, to be a Fellow in Class II., Section 3.

Richard Swann Lull, of New Haven, to be a Fellow in Class II, Section 3.

John Broadus Watson, of Baltimore, to be a Fellow in Class II., Section 3.

Frederick John Foakes-Jackson, of New York, to be a Fellow in Class III., Section 1.

Arthur Lord, of Plymouth, to be a Fellow in Class III., Section 1.

Charles Edwards Park, of Boston, to be a Fellow in Class III., Section 1.

Edward Douglass White, of Washington, to be a Fellow in Class III., Section 1.

Eugene Watson Burlingame, of Albany, to be a Fellow in Class III., Section 2.

Joseph Clark Hoppin, of Boston, to be a Fellow in Class III., Section 2.

William Guild Howard, of Cambridge, to be a Fellow in Class III., Section 2.

Ralph Adams Cram, of Boston, to be a Fellow in Class III., Section 4.

Edward Waldo Emerson, of Concord, to be a Fellow in Class III., Section 4.

Horace Howard Furness, of Philadelphia, to be a Fellow in Class III., Section 4.

Chester Noyes Greenough, of Cambridge, to be a Fellow in Class III., Section 4.

Francis Barton Gummere, of Haverford, to be a Fellow in Class III., Section 4.

Allan Marquand, of Princeton, to be a Fellow in Class III., Section 4.

Richard Clipston Sturgis, of Boston, to be a Fellow in Class III., Section 4.

The following gentlemen were elected Foreign Honorary Members:—

Tullio Levi-Civita, of Padua, Italy, to be a Foreign Honorary Member in Class I., Section 1.

Frank Dawson Adams, of Montreal, to be a Foreign Honorary Member in Class II., Section 1.

Ramon Menendez Pidal, of Madrid, to be a Foreign Honorary Member in Class III., Section 2.

The following communication was presented:—

Professor Charles R. Lanman. "The Harvard Oriental Series; its Purpose and Set-backs and Progress."

The following papers were presented by title:

"Fraxinus in New Mexico and Arizona." By Alfred Rehder.

"The Algae of Bermuda." By Frank S. Collins and Alpheus P. Hervey.

On motion of Professor W. T. Sedgwick, it was

Voted, That the thanks of the Academy be extended to Dr. Henry Pickering Walcott on his retirement from the Presidency for his able and faithful administration of that office.

The meeting then adjourned.

BIOGRAPHICAL NOTICES.

CLEVELAND ABBE (1838–1916)

Fellow in Class II, Section 1, 1884.

To be known, for a quarter-century, as the dean of American meteorologists; to be recognized as the chief factor in bringing about the inauguration of our national system of weather forecasts; to be accepted as the mainstay of meteorology in the United States and as one of the world authorities in this science — these are no slight distinctions. They were accorded, and accorded ungrudgingly, to Cleveland Abbe, for nearly fifty years an active officer of our national weather service; a modest, careful scientific worker; a ready helper of all who came to him for advice and information; a veritable storehouse of meteorological facts; a devoted student who knew the literature of his science as few do, and as few have done. The death of Abbe, on Oct. 28, 1916, at the age of 77, has removed the last of the pioneers of the older school of American meteorologists. His work laid many of the foundations upon which our later progress has been built up.

Abbe early became a tremendous reader and his attention, even in boyhood, was directed toward the phenomena of the sky and of the air. His first work was astronomical. He studied at Ann Arbor (1858–60), and with Gould in Cambridge (1860–64). He was at the Pulkova Observatory, in Russia, for two years, under Struve; later at the United States Naval Observatory as aid, and in 1868 became director of the Cincinnati Observatory. Here his career as a meteorologist really began. On September 1, 1869, he there inaugurated a system of telegraphic daily weather reports and daily weather maps for the purposes of weather forecasting. Of this undertaking he wrote to his father: "I have started that which the country will not willingly let die." This pioneer venture was brought to the attention of the National Government, and on Feb. 4, 1870, Congress passed a joint resolution establishing a meteorological service under the jurisdiction of the Chief Signal Office of the Army.

On the invitation of Gen. A. J. Meyer, the Chief Signal Officer, Abbe entered the Government service in January, 1871, and was given charge of weather forecasting. For some time he did the lion's share of the work, and under him the early forecasters of the Signal Service were trained. For twenty years (1871–1891), Abbe was professor of meteorology and civilian assistant in the office of the Chief

Signal Officer and when, in 1891, the transfer of our Government meteorological work to the Department of Agriculture was accomplished, Abbe continued as professor of meteorology in the Weather Bureau. Through six changes of his administrative chiefs, until his resignation in August, 1916, Abbe kept on with his work, often under conditions which, to his sensitive nature, must have been trying in the extreme. Patient; uncomplaining; devoted to his studies, he continued faithfully at his post.

Abbe's remarkable knowledge of the literature of his science served him well in the preparation of his "Treatise on Meteorological Apparatus and Methods" (*Appendix 46, Annual Report of the Chief Signal Officer for 1887*), a practical and historical report of enduring value, and of "A First Report on the Relations between Climate and Crops" (*U. S. Weather Bureau, Bulletin 36*, 1905), as well as in his contributions to the "Bibliography of Meteorology" (*U. S. Signal Service*, 1891), a valuable but comparatively little known publication. The many duties of his position in Washington left Abbe little time for original investigation. As a partial substitute for such work on his part he brought before English and American readers an important, and indeed for working dynamical meteorologists an indispensable, collection of translations of important foreign memoirs ("Short Memoirs on Meteorological Subjects," first collection, *Annual Report of the Smithsonian Institution for 1877;* "The Mechanics of the Atmosphere"; second collection, *Smithsonian Miscellaneous Collections*, 843, 1891; third collection, Vol. 51, No. 4, 1910). By the publication of his "*Report on Standard Time*" (1879), Abbe became one of the leading promoters of the introduction of standard time in the United States.

It is as the editor, for many years, of the *Monthly Weather Review*, that Abbe will doubtless be longest and best known. In that position, his extraordinary grasp of meteorological literature, and his remarkable memory, made him invaluable. Not only did he himself write a very large number of articles, but he made frequent and helpful comments on the contributions of others, which added greatly to the value of the *Review* and made it one of the leading meteorological Journals of the world. In his capacity as editor, Abbe carried on an enormous correspondence, a good deal of it written with his own hand. He was always ready generously to assist all who came to him for information or for advice. Of peculiar interest to him were all questions that concerned meteorological education. He was keenly alive to every opportunity to advance and to improve meteorological teaching in

the United States, and never weary of emphasizing the importance of sound training for meteorologists along mathematical and physical lines. Abbe held two academic positions. He was professor of meteorology at Columbian (now George Washington) University from 1886 to 1909, and lecturer in meteorology at Johns Hopkins University from 1896 to 1914. As a part of his work for meteorological education may be mentioned further his activity in connection with the International Meteorological Congress at Chicago (1893), and his editorship of the "Bulletin of the Mount Weather Observatory" (1909–1913). Through his articles on Meteorology in the *Encyclopaedia Britannica* he brought sound meteorological information to large numbers of general readers.

Abbe was a member of many scientific societies, both in the United States and abroad. He was elected a Fellow of the American Academy of Arts and Sciences in 1884. Two distinguished honors were awarded him abroad. He received the degree of LL.D. from the University of Glasgow in 1896, and the Symons Gold Medal of the Royal Meteorological Society (London) in 1912. The president of the Society, in presenting this medal, said of Abbe that he "has contributed to instrumental, statistical, dynamical, and thermodynamical meteorology, and forecasting," and "has, moreover, played throughout the part not only of an active contributor but also of a leader who drew others into the battle and pointed out the paths along which attacks might be successful." In April, 1916, Abbe was awarded the Marcellus Hartley gold medal of the National Academy of Sciences for "eminence in the application of science to the public welfare, in consideration of his distinguished service in inaugurating systematic meteorological observations in the United States."

During his lifetime, Abbe's modesty and self-depreciation to a large extent kept him from occupying the position of scientific prominence to which his learning and his service to meteorology entitled him. Now that he is dead, his work for the science to which he so faithfully devoted himself for fifty years is seen to have been far more important than even those who knew him best ever realized. Abbe's devotion to his work was an inspiration. His enthusiasm was a stimulus to all who came in contact with him. His cheerfulness and his patience were an example which could not fail to encourage his associates and his colleagues, everywhere.

ROBERT DEC. WARD.

SIR THOMAS LAUDER BRUNTON (1844–1916)

Foreign Honorary Member in Class II, Section 4, 1901.

Thomas Lauder Brunton was born in Scotland, took his M. B. with honors at Edinburgh in 1866, his M. D. in 1868, with a gold medal for his thesis on Digitalis with Some Observations on the Urine. This thesis was based on experiments on himself. His friend, Sir David Ferrier, says in The Lancet,— "When experimenting on himself with digitalis he lived a life of penance for six months; and he told me that one of the greatest pleasures he ever experienced was when he felt at liberty to eat and drink without having to weigh and measure his ingesta and egesta." He was altogether too human to be an ascetic; but for the sake of science he could mortify the flesh. In his first Lettsomian lecture, 1885, the reading of which, as indeed of much of Brunton's writings, might be of service to preachers of the present day calories, alcohol-always-a-poison apostles, he says:

'The nerves of taste, like those of sight and hearing, are nerves of special sense, and are capable of education. But, while we usually regard the education of the senses of sight and hearing as a noble thing, we are too careless of the education of our taste, and look upon it rather as something degrading.

'Yet the education of the nerves of taste should be considered in the same light as that of the other special senses; and cookery has, I think, a perfect right to be ranked with music, painting, sculpture, and architecture as one of the fine arts. The difference between cookery and music, or painting, is, that while the objects which give rise to sight and sound remain outside the body, we are obliged to swallow the substances which excite sensations in our nerves of taste. It is not quite sufficient to turn them over in the mouth and put them out again, because the full sensation is only obtained just in the act of swallowing. For this reason devotees to the art of cookery must either be content with a moderate enjoyment of the pleasures of taste, or consent, like some of the Roman emperors of old or German students of the present day, to eject again the food or drink which they have already taken and enjoyed.

'Only rarely does one meet with a dinner which gives one the sense of high artistic perfection, although I remember having partaken of one such when enjoying the hospitality of a City company. Each course seemed to excite an appetite for the one which succeeded, and

was accompanied by a wine so carefully selected that it gave zest to the food, while the food appeared to give additional flavour to the wine.

'This dinner was a revelation to me; it not only showed me that cookery might rank as one of the fine arts, but taught me that it might be a powerful moral agent. I went to the dinner exhausted with overwork, irritable in temper, and believing that City companies were wasteful bodies, who squandered money that might be employed for useful purposes, and that they should be abolished; I came away feeling strong and well, with an angelic temper, and firmly convinced that City companies had been established for the express purpose of giving dinners, and ought on no account to be interfered with. Nor was the good thus effected of a transitory nature; the irritability of temper, which had disappeared in the course of dinner, did not return; and the morning afterwards, instead of awaking with headache and depression, I awoke strong, well, and ready for work, and remained so for a considerable length of time. Nor do I think that mine is a solitary case. A succession of heavy dinners is, no doubt, injurious; but when the organism is exhausted, a good dinner, with abundance of wine, is sometimes of the greatest possible use. But there is one condition which must not be neglected, or otherwise the consequences will be anything but satisfactory; the dinner must be well cooked, and the wines must be thoroughly good.

'It is, as I have said, only occasionally that one meets with real high artistic cookery. But, even in the courses of an ordinary dinner, an order is adopted which is thoroughly physiological, and which shows that, whatever men may be in other things, they are not "mostly fools" in regard to the plan of their meals.'"

The above contains so much truth, and throws so much light on Brunton, his life work, and his brilliant success as a consultant, that no abstract would take its place.

He served for a year as resident in hospital, and then spent about two years in laboratory work in Vienna, Berlin, Amsterdam, and Leipsic. In the latter place he was busy on the action of nitrites, and introduced amyl nitrite as a remedy for angina, thus, according to Mitchell Bruce, being "the first to employ a remedy in disease because its pathological action was to act in an opposite manner to the pathological condition which he had discovered in the disease — angina pectoris — vis., rise in blood pressure." Rise in the general blood pressure is by no means invariable in angina — but let that pass.

He then, like many another canny Scot, settled in London, becoming casualty physician and lecturer on Materia Medica at Bartholomew's

in 1871. This hospital connection lasted for thirty-three years, twenty as assistant, and nine as physician. He then resigned before he had reached the age limit, and became Consulting Physician and Governor to the Hospital. He acquired fame as a consultant, and among those who sought his advice were many Americans.

He was a prodigious worker. This is not the place for a full list of his publications and activities. At thirty he was elected a Fellow of the Royal Society. He was Goulstonian, Lettsomian, and Croonian lecturer, and Harveian orator. He was Fellow of the Royal College of Physicians, and for years one of the examiners; prominent in the British Medical Association, knighted in 1900, created Baronet in 1908. His writings, which are many and varied, deal mainly with Pharmacology and Therapeutics, based upon and colored by experimental physiology. In this line of work he was among the first. A hint of the breadth of his therapeutic horizon is afforded by his paper on "The Science of Easy Chairs," originally printed in Nature. His largest work was his text book of Pharmacology, Therapeutics, and Materia Medica, 1885. Several editions were called for, and also translations in several languages. Other books were "Disorders of Digestion," "Disorders of Assimilation," "Collected Papers on Circulation and Respiration," and "Therapeutics of the Circulation." The first edition of the latter appeared in 1908, a second March 14, 1914, "My 70th birthday," as he writes in a presentation and greatly valued copy to the writer of this inadequate sketch. It is interesting to note that this last named book was dedicated to Kronecker, a fellow worker in Leipsic under Ludwig, and a life-long friend. Brunton had actively supported all plans for furthering national health, school hygiene, and military training, and foresaw the inevitability of the present war. In August, 1915, Sir Douglas Haig writes him,— "You and I have often talked about the certainty of this war, and have done (each of us) our best to prepare in our own spheres for it."

He thought he had many valued friends among the German professors, and was not prepared for their attitude toward the war in general, and the British in particular. This attitude was a great grief to him. In October, 1915, his younger son was killed in action in France. His heart had for years given him trouble, at times serious, righted itself more than once, but finally gave out after distressing disability.

F. C. SHATTUCK.

LUIGI PALMA DI CESNOLA (1832–1904)

Fellow in Class III, Section 4, 1881.

Luigi Palma di Cesnola was born at Rivarola June 29, 1832. After completing his education at the Royal Academy of Turin, he served with distinction in the Sardinian army during the revolution of 1848, and again in the Crimean war. The same love for liberty which led him into the war against Austrian rule brought him to the United States, where he was naturalized as a citizen in 1860. Enlisting in the army he was rapidly promoted till he became colonel of the fourth New York Cavalry. At the battle of Aldie he was severely wounded and taken prisoner, being held in Libby prison for nearly a year. Liberated in 1864 he served again till the close of the war and was mustered out with the rank of Brigadier General. From 1865 to 1876 he was Consul General of the United States in Cyprus. Here he soon became interested in antiquities, conducted extensive excavations, and gathered the largest collection of Cypriote antiquities that has ever been made. The acquisition of the main part of this collection by the Metropolitan Museum again brought Cesnola into relation with New York. In 1876 he resigned his post in Cyprus to become Secretary of the Metropolitan Museum, and in 1879 he was made Director, a position which he held till his death November 21, 1904. He held the degree of Doctor of Laws from Columbia and Princeton, in 1897 he received the medal of honor from Congress, and the King of Italy caused a gold medal to be struck in his honor besides granting him several knightly orders.

Although a student of art in his boyhood, his interest in the work for which he gained renown was largely the result of circumstances. When he came to Cyprus in 1865 his labors as consul for the United States and for Russia were not arduous, his British and French colleagues were already engaged in collecting antiquities, and he found abundant opportunity to engage in the same pursuit. His success in winning the friendship of the natives brought him early information of important discoveries, while his genius for organization proved invaluable in the excavations he undertook. General di Cesnola was not a scholar or an archaeologist, but a collector. In 1865, when he began his work, scientific excavations were as yet unknown, and relatively little was known of the complex problems raised by Cypriote antiquities. That Cesnola failed to develop scientific methods of

excavation as they were developed by later excavators, has elicited criticism as bitter as it is unjust; that his records are incomplete and apparently sometimes inaccurate, is a just criticism on his work; that he was a most skillful excavator and a successful pioneer in bringing to the attention both of scholars and of the general public a vast mass of material illustrating ancient art in Cyprus, remains unquestioned. Of the charges brought against him by M. Gaston L. Feuardent and others in 1880–1882 that many of the antiquities were "faked," falsely restored, etc., it is enough to say that they were not substantiated. Recent careful examination of the objects in New York by trained scholars has revealed no trace of falsification. The great collection purchased for New York in 1872 is still the glory of the Metropolitan Museum of Art.

In his work as Director of this Museum General di Cesnola showed the same qualities of leadership that appeared in his work as excavator and collector. To blame him for not making the museum a great factor in popular education is, again, to judge him by the standards of a later age. The organizing genius that directed the work of the institution for nearly thirty years, built up its collections, arranged its exhibitions, and laid the foundation for its recent growth has won the respect and admiration of all who are familiar with what Cesnola accomplished there. He was a successful pioneer in this field, as in the field of Cypriote antiquities.

In the minute of the trustees of the Metropolitan Museum on the occasion of his death, the following estimate of his work is given:

"His fidelity, his minute attention to his duties and his capacity for work during his long career of service, merit great praise. Other distinctions and other interests in life, if not forgotten, were permanently laid aside, and the welfare and growth of the Museum became his single interest and absorbing occupation. His military training, when joined to his public experience, gave him distinguished powers of administration; and, while critics are never wanting, his capacity to administer the Museum and adequately to exhibit its contents has not been questioned."

ARTHUR FAIRBANKS.

SAMUEL FRANKLIN EMMONS (1841–1911)

Fellow in Class II, Section 1, 1903.

Samuel Franklin Emmons, one of the most eminent students and investigators of economic geology, was born in Boston, March 29, 1841, and died at his home in Washington, March 28, 1911, thus lacking only one day to complete his seventieth year. Since 1867 he was connected with the federal scientific surveys, first as a member of the Geological Exploration of the Fortieth Parallel under Clarence King and later, since 1879, as a geologist of the U. S. Geological Survey. For both organizations he performed most important scientific work both of a purely geological and practical nature and his name will always be prominently associated with the development of geology in America.

Emmons obtained his degree of Bachelor of Arts at Harvard and afterward studied three years at Ecole des Mines in Paris and at the Bergakademie at Freiberg. Returning to the United States he joined the Fortieth Parallel Survey in 1867, a work admirably planned for obtaining the greatest efficiency and speediest results in geological reconnaissance. A large part of the geological results of this survey is due to the painstaking and exact work of Emmons.

When the U. S. Geological Survey was created in 1879 Emmons was selected to take charge of investigations in economic geology. The first important work completed was a monograph on the Leadville district in Colorado, a region presenting most intricate problems of mining geology. Emmons' monograph has been of the greatest value and importance to the miners and it may be said that it is the most monumental evidence of the value of geology to the mining industry. In this and in the many later reports published by Emmons the importance of "replacement" as a process in ore formation was strongly emphasized and it is one of his principal merits to have made the mining engineer acquainted with this mode of nature's operation, by which, for instance, ore bodies of galena take the place, molecule for molecule, as it were, of strata of limestone.

Space does not suffice to mention all the investigations and reports which occupied his time. Among other mining districts he examined may be mentioned Butte, Aspen, Mercur, Bingham, the Black Hills, and Cananea.

In 1900 he contributed a most important paper to the Institute of

Mining Engineers, entitled "Secondary Enrichment of Ore Deposits" in which for the first time attention was drawn to the rich sulphides just below the water level which owe their origin to the descending surface waters. Emmons' contributions to geological literature were contained in nearly 100 monographs, reports and papers.

Emmons' name, as a mining geologist, is known all over the world. Thoroughness, efficiency and good judgment characterized his work throughout. His kindly and unselfish personality endeared him to all who had the privilege of his acquaintance and he was a potent influence in the work of younger geologists in the organization in which he for many years directed the investigations in mining geology.

WALDEMAR LINDGREN.

DANIEL COIT GILMAN (1831–1908)

Fellow of Class III, Section 2, 1875.

Daniel Coit Gilman was born July 6, 1831, at Norwich, Connecticut, and died in the town of his birth, October 13, 1908. He was the son of William Charles Gilman (1795–1863) and his wife, Eliza Coit (1796–1868), and connected with many of the best-known families immigrant from England to New England in the seventeenth century.[1] The facts of his life are briefly and admirably told by his brother, William Charles Gilman, in the *Johns Hopkins University Circular* for December, 1908; and more fully in *The Life of Daniel Coit Gilman* by Fabian Franklin, New York, 1910. But nowhere, now that he is gone, can one get a better idea of his character and personality than from his own public addresses, especially the collection made by him, and published at New York in 1906 under the title, *The Launching of a University, and other papers: a sheaf of remembrances.*

Mr. Gilman received the bachelor's degree at Yale in 1852 and spent the following year there as a resident graduate. "On the whole," he says, "I think that the year was wasted." And his experience at Harvard in the autumn of 1853 was similar. So far as his then

1 See *The Gilman Family*, by Arthur Gilman, Albany, N. Y., 1869; *The Coit Family*, by F. W. Chapman, Hartford, Conn., 1874.

immediate purpose was concerned, his estimate of these two experiences is doubtless true. But nothing could be further from the truth, if we consider his experience of the scantiness of opportunity for advanced non-professional study at Yale and Harvard in its bearing upon the great problems that were to confront him twenty-two years later. We may well deem it the most happily fruitful failure of his whole life.

His public service began even in that "wasted year." For in August, 1853, the first annual convention of American Librarians was held, largely as the result of his efforts. In December, 1853, he and his life-long friend, Andrew Dickson White, sailed for Europe as attachés of the American Legation at St. Petersburg. Here his official position gave him uncommon opportunities for learning about libraries and schools and other institutions for public welfare, an admirable preparation for the work of his life as a leader in educational and social progress. On returning, he became librarian at Yale (1856–1865), and then professor of physical and political geography in the Sheffield Scientific School, and indeed virtually its chief executive, improving its working-plans and strengthening its finances. From 1872 to 1875 he served as president of the University of California, and, in the face of most discouraging obstacles, succeeded in placing it upon a much securer foundation. Then came the call to organize the new institution created by Johns Hopkins at Baltimore. The Trustees, a group of enlightened and devoted men, sought the advice of President Eliot of Harvard and President White of Cornell and President Angell of Michigan, invited them to come to Baltimore to give it by word of mouth, and wrote to each of them after their return home asking whom they would suggest for the office of president. They all with one accord, and without any previous conference on the matter, replied that "the one man" was Daniel C. Gilman.

Now that university education in America has grown to be what in large measure Mr. Gilman's initiative and example have made it, it is hard to realize what the problem then was. The will of Johns Hopkins left the utmost freedom to the Trustees. Should they, as was suggested, "raise an architectural pile that shall be a lasting memorial of its founder"? should they establish one more college? At his first meeting with the Trustees, Mr. Gilman urged them to create a "means of promoting scholarship of the first order," something, as he himself says, that should be "more than a local institution" and that should "aim at national influence." Those whose privilege it was to hear the testimony of such men as President Eliot or Francis

A. Walker in the early eighties, were abundantly assured of the fact that President Gilman's broad and noble ideals were indeed becoming realities, and realities of great influence as examples the country over. On the occasion of Mr. Gilman's retirement after twenty-five years of service, Mr. Eliot's address specifies three great achievements: the creation of a school of graduate studies, the prodigious advancement of medical teaching, and the promotion of scientific investigation. The first overtures looking to Mr. Gilman's appointment as president of the Carnegie Institution came some six months after his resignation of the presidency of the university. Although past the limit of three score and ten, he served the Institution for three years at the critical time when the fundamental purposes of so novel an undertaking were yet to be determined.

Of the amount and variety of Mr. Gilman's public service outside the sphere of strictly official duty, it is not feasible in a brief paragraph to give an adequate idea. The very important position of Superintendent of the Schools of New York City he felt obliged in 1896 to decline. But as member of the Board of School Commissioners of Baltimore, as president of the Slater Fund for the Education of Freedmen, as member of the General Education Board, as a trustee of the Russell Sage Foundation, as president of the National Civil Service Reform League, and of the American Oriental Society (with whose early history and most eminent members he was intimately acquainted), he was a fellow-worker of amazing constancy and faithfulness,— "a fellow-worker," for he always thought and spoke of his associates, not as subordinates, but as colleagues.

As one looks back on Mr. Gilman's presidency at Baltimore, it seems as if he could not have fitted himself better for it, even if he had known that just *that* was to be the main business of his life. His personal acquaintance with men eminent in science and letters, men like Huxley and Cayley and Lord Kelvin, men like Lowell and Child and Whitney, his wide and studious observation of great technical schools and his experience in the building up of the one at Yale, his realization of the unity of knowledge, his intelligent comprehension of the aims of the most diverse fields of study,— these were factors of his equipment for the work of "naturalizing in America the idea of a true university." Many men of equal industry and force have failed because they did not realize as he did "the inanity of rivalry, the pettiness of jealousy, and the joyfulness of association for the good of mankind." The informing principle of his life was service to others. As an old-time New Englander, he was brought up in obedience to

"Duty, stern daughter of the voice of God." But to him the paths of duty were also ways of pleasantness. For it was a supreme delight to him to see his pupils and associates and colleagues become men of distinguished usefulness to their fellow-men. It was, I believe, one of the greatest secrets of his success as president of the university that he made his associates feel sure that he took a genuine and sympathetic interest in what they were doing. He was wont to quote Emerson's saying, "Nothing great was ever achieved without enthusiasm." With Mr. Gilman, enthusiasm was a divine gift, and from his living flame he was able to kindle the sacred torch in the hand of others. The belief that "the things which are not seen are eternal" was part of his very life, and sustained his courage in the absence of showy results for which many were hoping. To few lives do the words of St. Paul at Antioch more fitly apply: He "fell on sleep, after he had served his own generation by the will of God."

CHARLES R. LANMAN.

FRIEDRICH KOHLRAUSCH (1840–1910)

Foreign Honorary Member in Class I, Section 2, 1900.

Friedrich Kohlrausch was born in Rinteln, Oct. 14, 1840, and died in Marburg, Jan. 17, 1910.

There is a commonly accepted belief that successive generations of the same family do not attain great distinction. To this the family of Kohlrausch is an exception. Rudolf Kohlrausch, the father of Friedrich, was a distinguished physicist and professor in the University of Göttingen, well known because of his determination, with Wilhelm Weber, of the relation between the electrostatic and electromagnetic unit of current, which forms one of the great landmarks in the history of our science. His grandfather, it may be noted, was a historian, also of national reputation, whose history of Germany, in two volumes, ran through sixteen editions at a time when such occurrences were less common than now.

The father died when the son was but eighteen (1858), leaving Friedrich to pursue his studies alone. He obtained his doctor's degree at Göttingen with his father's colleague, Weber, in 1863, and

after a short service as Docent in the laboratory of the Physikalischer Verein in Frankfurt, entered upon his academic career as professor extraordinarius in 1866 in the same university. After four years of service in Göttingen, he was appointed Ordinarius at Zürich in 1870. The fear of annexation, widely current in Switzerland during the Franco-Prussian war, aroused some bitterness even in academic circles, and Kohlrausch never looked back upon his residence in Zürich with pleasure. He returned to Germany (Darmstadt Polytechnicum) the following year. It was in the University of Würzburg, to which he was appointed in 1875 and where he remained for thirteen years, that his most fruitful work, namely, that on the conductivity of solutions, was begun. These studies of conductivity were continued with occasional interruptions throughout his active career.

In 1888, Kohlrausch was chosen to the professorship of physics in Strassburg, and in 1894 he was invited to become the successor of Kundt in the great University of Berlin. This latter position, to occupy which was to be accredited the dean of the German university physicists, Kohlrausch declined, partly for reasons of health and partly because of the tremendous volume of administrative work required of the occupant of this chair. But a few months elapsed, however, before he was called again to Berlin, this time as President of the Physikalisch-technische Reichsanstalt in succession to Helmholtz. In this position Kohlrausch proved a veritable inspiration to the considerable group of young men (of which the writer had the good fortune to be one) which had been gathered together for research in connection with the fundamental standards of physical measurement, and it was during his administration that the Reichsanstalt took its position at the head of institutions of its kind throughout the world. The English National Physical Laboratory, established at Teddington during this period, and the Bureau of Standards at Washington, were modeled directly from the Reichsanstalt.

The burden of this responsibility, however, proved to be too great for health which had never been rugged, and he laid it down amid universal regret and retired to private life in 1905. Even in his retirement a considerable number of papers testified to the continued fertility of this extraordinary brain, and at the time of his death in 1910 he had just completed the eleventh edition of his Lehrbuch der praktischen Physik, a book which has proved indispensable to every laboratory worker in physics during our time.

Since Kohlrausch's death his papers have been gathered together and published in two large volumes of "Gesammelte Abhandlungen,"

which, with the Lehrbuch above referred to, form a monumental record of scientific activity. To pass this in review is hardly practicable within the space of a short memorial sketch. He has made contributions to many branches of physical research, and through the "Lehrbuch" and the great variety of apparatus which bears his name, his relation to his chosen science, both in his own country and abroad, has been of the most intimate kind. Rather by way of illustration than with any purpose of presenting an adequate review of his scientific work, certain of his papers may be cited.

In the category of precise physical measurements we may notice first of all his determination of the ohm and a considerable number of papers upon the measurement of the earth's magnetic constants. In the course of these latter studies new methods and new apparatus were developed many of which are still fully equal to the most exacting requirements of modern quantitative science. The determination, in association with his brother Wilhelm, of the electrochemical equivalent of silver also finds a place in this period of his activity.

The name of Kohlrausch is perhaps most familiarly associated with the work on electrical conductivity in solutions which owes its foundation (the applicability of Ohm's Law to conductors of the second class) and much of its modern development (the theory of polarization, dissociation, and ionic conductivity) to the work of Kohlrausch and his pupils, among whom were included Arrhenius, Barus, Nernst, and many others hardly less distinguished.

ARTHUR L. DAY.

ERASMUS DARWIN LEAVITT (1836–1916)

Fellow of Class I, Section 4, 1878.

Erasmus Darwin Leavitt was born at Lowell, Mass. on October 27, 1836, and died in Cambridge, Mass. on March 11, 1916. He was named for his father, who was given the name because of his father's admiration for Darwin's grandfather.

The public schools of Lowell furnished young Leavitt his education up to the age of fourteen. After that he educated himself for the profession of mechanical engineer, supplementing his work in various machine shops with long and patient study far into the night. To

have become, under such conditions, one of the foremost men of the day in his profession, speaks volumes for his grit, pertinacity and ability.

After serving three years as apprentice in the Lowell Machine Shops, he entered the employ of Corliss & Nightingale. In 1858 he served as assistant foreman in the works of Harrison Loring at South Boston, where he had charge of constructing the engine of a United States man-of-war. The next three years found him in Providence, filling the position of chief draftsman for Thurston, Gardner & Co., celebrated at that time as builders of high grade steam engines.

At the outbreak of the Civil War, Leavitt enlisted in the engineers' department of the Navy. He served for nearly three years on the gunboat Sagamore, attached to the Eastern Gulf Squadron; where he reached the grade of second assistant engineer. After this, he was transferred to construction work in several of the United States Navy Yards. In 1865, he was detailed as instructor of steam engineering at Annapolis. Two years later he resigned from the Navy, and opened an office for the practice of mechanical engineering.

One of his first pieces of work, designed for the Plymouth Cordage Co., was a simple condensing walking beam engine, which is still in working order. After the construction of this engine, Mr. Leavitt remained the consulting engineer of the Company until his retirement from business.

It was not long before Mr. Leavitt's engines began to attract wide attention. He had for some time been interested in the economy of pumping engines, and his fame as an engineer may be said to date from the installation of an engine for the Lynn Water Works, embracing all his ideas of efficiency and economy.

Without entering into the details of the construction of this pump, it is sufficient to state that it set a world wide standard for pumping engines. It was officially tested by a number of the best experts of the day, and developed a duty of over 103,900,000 foot pounds per hundred pounds of picked Lackawanna anthracite.

Shortly after this, Mr. Leavitt designed a pair of similar, but somewhat larger pumping engines for Lawrence, Mass.

By 1874 his fame was so well established, that when Mr. Alexander Agassiz was looking about for an engineer to take charge of designing the equipment of the Calumet and Hecla Mine, the latter's choice fell on Mr. Leavitt.

This opened up a wide field for a mechanical engineer. For Mr. Agassiz was looking ahead to the future great development of the mine, and it was his policy to install an equipment for the coming

years, and to install it in duplicate, to avoid the loss that would otherwise arise from any delays caused by accidents to the plant.

Mr. Leavitt stood for low speed engines of high economy, and to this end he used a complicated valve gear. The initial cost of such engines was high, but he always justly maintained, and in this he was upheld by Mr. Agassiz, that the cost of any engine was of slight account compared to its efficiency. Many experts have doubted if this holds true for hoisting engines, on account of the irregularity of the load. It is only of recent years that it has been generally acknowledged that high efficiency hoisting engines justified their expense.

The "Superior," installed in 1883, was the largest hoisting engine Mr. Leavitt built for the Calumet and Hecla. It was an inverted compound beam engine with cylinders 40′ and 70′ in diameter. The fly wheel and the belt wheel were both 36 ft. in diameter. This engine was designed to hoist six four ton skips from a depth of four thousand feet, and also to run four Rand compressors. As this was vastly in excess of the needs of the day, the engine was looked on as a foolish monster by many people. In 1911 it was hoisting five ton skips from a depth of six thousand feet, and it is still doing efficient work to-day.

The steam stamps that Mr. Leavitt designed for the Calumet and Hecla marked a very distinct advance in the construction of such machinery. The distinctive feature of these stamps is a steam cylinder with two pistons, one with steam on top to give the blow, while under the other is a constantly applied reduced pressure to lift the stamp, the steam being forced back to the boiler with each blow.

Mr. Leavitt was not inclined to talk of his achievements. Once when he was asked how he got the idea of the Leavitt stamp, he replied: "One day in the Calumet mine, I stepped on the man engine at the twentieth level to go to the surface. I had no thought how to meet the problem at the moment. But when I stepped off, about twenty minutes later, the whole scheme was clear in my mind." To properly appreciate this feat, one should realize that the man engine, now obsolete, offered an absorbing and somewhat hazardous method of transportation, which fully occupied the attention of most people making use of it.

One of Mr. Leavitt's pumping engines for the Calumet and Hecla mills, had a capacity of sixty million gallons in twenty-four hours. It remained the largest pump of its day, until superseded by an engine of seventy-five million gallons per twenty-four hours, designed by Mr. Leavitt for the sewer works of the City of Boston.

His designs for Calumet included sand wheels of metal, instead of

wood, the construction previously used in Northern Michigan. Two such wheels, built like bicycle wheels, had diameters of fifty and sixty feet.

Until ill health caused his retirement from business in 1904, Mr. Leavitt continued to act as consulting mechanical engineer for the Calumet and Hecla Mine. But his activities were by no means confined to work for that company.

He acted as consulting engineer for Henry R. Worthington; developed their high duty pumping engine for the Dickson Manufacturing Co.; and assisted the Bethlehem Steel Co. in modernizing their plant and in introducing hydraulic forging.

He designed three huge pumping engines for the Boston sewage department; and pumping engines for the following city water works: Cambridge, Mass., New Bedford, Boston, and Louisville. That for the last named city broke all previous records for economy in consumption of steam.

A pair of engines which he designed for the Washington Mills at Lawrence, have been steadily at work since 1887. He designed the equipment of the El Callao Mining Co. of Venezuela. The first engines of the cable railway of the Brooklyn Bridge came from the drawing boards of his remarkably efficient and well organized office in Central Square, Cambridgeport.

Mr. Leavitt's fame as a mechanical engineer was international, and during his frequent visits abroad he established a wide circle of professional friends. He was on intimate terms with the Krupps, and was on board their yacht Rona at the opening of the Kiel Canal.

A roomy old fashioned house on the slope of the hill on Harvard Street, Cambridgeport, was Mr. Leavitt's home for many years. There he delighted to entertain the prominent members of his profession, and many eminent European engineers enjoyed his hospitality. He was an ardent church man, a man of broadly charitable instincts, and widely known for the liberality of his gifts.

He was distinguished for an exceptional command of English, which was evident to a casual acquaintance. Although of a retiring character, his affectionate disposition and inborn geniality endeared him to all who were fortunate enough to penetrate his reserve.

Mr. Leavitt was one of the thirty founders of the American Society of Mechanical Engineers, and served as its president in 1882–83. He was a foreign member of several European engineering and scientific societies, and for many years was on the visiting committees of the Engineering Department, and of the Observatory of Harvard

University. He was elected a Fellow of the American Academy of Arts and Sciences in 1878, and long served on its Rumford Committee.

The last years of his life were passed in a house that he built for himself on Garden Street, Cambridge. Mr. Leavitt had worked so hard that he never learned to play; and although fondly cared for by his family, to whom he was devoted, and notwithstanding his interest in civic affairs, it is to be feared that time hung heavily on his hands, when he felt that his health demanded his retirement from business.

In 1867 he married Anne Elizabeth Pettit of Philadelphia who died in 1889. They had five children, the survivors being Mrs. Walter Wesselhoeft, Mrs. Paul Van Daell, and Miss Margaret A. Leavitt.

G. R. Agassiz.

PERCIVAL LOWELL (1855–1916)

Fellow in Class I, Section 1, 1892.

On both his maternal and paternal sides Percival Lowell came of stock prominent in the development of New England. The cities of Lowell and Lawrence were named for his ancestors. His father, Augustus Lowell, was a Vice President of the American Academy, his mother Katharine Lawrence was the daughter of a former Minister to Great Britian.

Lowell was born in Boston on March 13th, 1855, and fitted for college at "Noble's" school. He took honors in mathematics at Harvard and graduated *cum laude* in 1876. The elder Pierce spoke of him as one of the two most brilliant mathematicians whom he had seen at Harvard.

After leaving college he entered business in Boston. Unlike most devotees of pure science he possessed a marked gift for business matters, and became a force in the business world, where he occupied various positions of responsibility and trust.

From 1883 to 1893 he devoted his life chiefly to literature and travel. Much of this time was spent in the far East, chiefly in Japan, where for some years he made his headquarters in a charming native house in Tokio. He was appointed foreign secretary of the Special Mission from Korea to the United States, and conducted its travels

through this country. On their return to Korea he remained for some time as the guest of the government. The result of this experience was a volume entitled "Chosön — The Land of the Morning Calm." The work is full of imagination and charm and infused with the light touch and true literary gift which never deserted him, and was as carefully fostered in his scientific work as elsewhere. His writings during this decade include the "Soul of the Far East," which Janet, the French psychologist, has cited as showing a remarkable insight into the Oriental mind; also a treatise on some hitherto little known aspects of Shintoism; and "Noto," a delightful account of his travels in an out-of-the-way corner of Japan.

He had always taken a keen interest in Schiaparelli's work on Mars. In the early nineties that distinguished astronomer's eyesight had so far failed that it was evident his observing days were over. Then Lowell determined to take up Schiaparelli's work where the latter had left it.

Before establishing an observatory, with characteristic thoroughness, he searched diligently for the best available spot — his investigations including sites in America, France, Algiers, the Mexican Plateau, and a station in the Andes.

One of the results of these investigations was to show that the "seeing" on an elevated plateau is much better than on a mountain top. While no place has been found better than the site chosen at Flagstaff, Arizona, it seems probable that even better results would have been obtained could the Observatory have been set back a mile or two from the edge of the table land on which it stands.

The Observatory founded in 1894 was intended chiefly for a study of the planets, especially Mars. But the investigations at the Observatory have been by no means confined to this field, much valuable work having been done on the constitution of comets, and the spectra and velocities of nebulae; while many refinements in stellar photography have been perfected there. Here the rotation of Venus and Uramus were both determined by the Doppler effect. Two of Lowell's mathematical investigations are of special interest. His "Memoir on a Trans-Neptunian Planet" gives the results of many years of painstaking labor, by himself and a staff of computors. The analysis of the disturbances produced on the outer planets by this unknown body was conducted by methods of celestial mechanics, differing considerably from those employed by Adams or Leverrier. It has not as yet been possible to verify the results either visually or photographically. A "Memoir on Saturn's Rings" is a most ingenious

investigation of the probable internal constitution of the planet, deduced from the relation of the position of the divisions of the rings to the satellites.

His work and theories on Mars are most widely known. His observations on that planet have accumulated an amount of data greatly in excess of the total results of all other observers combined. If the theory, which he deduces from this data, that Mars is inhabited, seems fanciful to many, it should at least be borne in mind that it is deduced from observed facts by logical reasoning. Furthermore, no other satisfactory explanation of the facts have ever been offered. His theory would doubtlessly have made much more headway in the scientific world, had it been less dogmatically presented.

The publications of the Observatory up to the time of Lowell's death include fully 2,100 quarto pages and 2,500 octavo pages. He was besides prolific in more popular works, the chief of which were; "Mars" (1895): "The Solar System" (1903): "Mars and its Canals" (1906): "Mars as the Abode of Life" (1909): "The Evolution of Life" (1909): "The Genesis of the Planets" (1916).

Lowell died suddenly of apoplexy at his Observatory on November 12, 1916, shortly after a most successful lecture tour in the West. He lies, fittingly, close to the dome of his telescope. His entire fortune, with a certain life interest for his wife, was left to maintain the Lowell Observatory as a separate institution. It is thought that its income will eventually be at least twice that of the Harvard Observatory.

G. R. Agassiz.

DMITRI IVANOVITSCH MENDELÉEFF (1834–1907)

Foreign Honorary Member in Class I, Section 3, 1889.

"Strecker, De Chancourtois, and Newlands stood foremost in the way towards the discovery of the periodic law, and . . . they merely wanted the boldness to place the whole question at such a height that its reflection on the facts could be clearly seen."

Mendeléeff's Faraday Lecture.

In such modest fashion this distinguished Foreign Honorary Member of the American Academy of Arts and Sciences characterized his greatest contribution to the sum of human knowledge.

Dmitri Ivanovitsch Mendeléeff, the youngest of fourteen children, was born to his parents, Ivan Pavlovitsch and Maria Dmitrievna, in Tobolsk, Siberia, on January 27th, (O. S.) 1834. His father, the Director of the College at Tobolsk, was a man of social preëminence and splendid education. It is his mother, however, who in greater measure excites our wonder and admiration. Under a regime which gave little opportunity for the higher education of women, she began to acquire the knowledge which she craved by repeating the lessons of her brother Vassili. "Books are the best friends of my life," she later assures us, "and it would be hard for me to exist only for the needs of the body, and to have no moments free for the heart, the mind, and the soul." Nor were her abilities limited to things intellectual, for when her husband lost his eyesight, and was compelled to resign, she administered with success and profit her brother's glass factory, and thus secured the means to bring up her numerous children.

Enrolled in the Gymnasium at Tobolsk at the early age of seven, Dmitri became deeply interested in science and mathematics. But he incurred the displeasure of his masters because of his distaste for languages, especially Latin — indeed he was always an inveterate foe of classicism in education. The closing years of his course brought with them his father's death, and the destruction of the glass factory by fire. In 1849, his mother wound up her affairs at Tobolsk, and brought her favorite son to Moscow. She intended to make him a student of medicine, but this career was closed to him when he collapsed at the sight of a corpse. In spite of failing strength and resources, she struggled on to St. Petersburg, where he was at last

admitted to the Pedagogic Institute of the University and granted a scholarship. In the autumn of this year the mother died, with the injunction: — "Refrain from illusions, insist on work and not on words. Patiently search divine and scientific truth."

At the University, in spite of a dangerous weakness of the lungs, he "found himself" from the mental standpoint, and astonished all his instructors by his zeal and ability. His dissertation on isomorphism was ready in 1855, and the brilliancy of his final examination was recognized by the award of a gold medal. Although the condition of his health necessitated his immediate departure for the Crimea, he was soon able to go back to St. Petersburg. In 1859 he studied with Regnault in Paris, and later with Bunsen in Heidelberg. Upon his second return to St. Petersburg he attained the doctorate, and was soon made Professor in the Technological Institute. In 1866 he became Professor of General Chemistry in the University, a position which he held till 1890, when he resigned in consequence of friction with the authorities; in 1893 he was appointed Director of the Bureau of Weights and Measures, a position which he held until his death on January 20 (O. S.), 1907.

Mendeléeff was twice married, first in 1863, to a lady named Lestshoff, by whom he had a son Vladimir and a daughter Olga. Divorced from her, he married, in 1881, Anna Ivanovna Popova, an artist of ability, who bore him four other children, Lioubov, Ivan, and the twins Maria and Vassili.

His interests were by no means confined to pure science. The tremendous development of the petroleum industry in Russia is closely associated with the name of Mendeléeff, as is also the exploitation of some of her largest coal fields. He made an intimate study of the tariff question and urged reasonable protection for Russian industries, a policy which had far-reaching consequences. Agriculture, art, astronomy, education, and philosophy all received attention for him. In 1875 spiritualism gained many adherents in St. Petersburg, and Mendeléeff suggested a commission to investigate it by scientific methods. After a thorough study of famous mediums, this body, of which he was a member, concluded that all such phenomena resulted from unconscious movements or deliberate deception. His last work (1906) "Information about Russia," which ran through four editions in the six months following its initial publication, discussed his country from racial, religious, economic, industrial and educational standpoints.

Mendeléeff's travels were extensive. He had a first-hand acquaint-

ance with the greater part of Russia; France and Germany he visited during his student years; in 1889 he delivered the Faraday Lecture in London, and again in 1891 he visited France and England to investigate the manufacture of smokeless powder. In 1893 he came to America, and attended the World's Fair in Chicago, which he did not fail to describe in an article published after his return.

Mendeléeff was a typical Russian; tall in figure, broad shouldered, with a head of unusual size, crowned with a remarkable abundance of hair. His full beard was blond; and his blue eyes deep set and piercing. His voice was deep, his gait rapid, and he was given to nervous and rapid movements of the hands. Restless, imperious, and brusque at times, nicknamed "the lion in his den," he was still affable, democratic, and deeply beloved by students and common people alike. He was a lifelong adherent of the Orthodox Church, and a ready friend to the discouraged and downtrodden. Such was the personality of one of Russia's greatest sons.

Mendeléeff's works, published between 1854 and 1907, include two hundred and sixty-six titles, according to Walden's compilation. They give evidence of the wide scope of his interests and activities, as already mentioned above. Among the purely scientific subjects which claimed his most careful attention were: — the densities of liquids, the relation between the volume of liquids and temperature, the formation of compounds between solvent and solute, and the compressibility of gases under reduced pressures. Of lasting influence upon instruction in the science is his masterly "Principles of Chemistry," which appeared in eight Russian and three English editions. Its most striking feature is found in the voluminous notes, appended to the text proper. These notes enlarge upon debatable subjects and theoretical questions, portraying Mendeléeff's personal opinions and habits of thought. In the Preface he remarks: —

"Knowing how contented, free, and joyful is life in the realms of science, one fervently wishes that many would enter their portals. On this account many pages of this treatise are unwittingly stamped with the earnest desire that the habits of chemical contemplation which I have endeavored to instil into the minds of my readers will incite them to the further study of science. Science will then flourish in them and by them, on a fuller acquaintance not only with the little that is enclosed within the narrow limits of my work, but with the further learning which they must imbibe in order to make themselves masters of our science and partakers in its further advancement."

His name will always be most closely associated with the announce-

ment of the Periodic Law. In March, 1869, before the Russian Chemical Society, he set forth his conclusions as follows: —

"1. The elements, if arranged according to their atomic weights, exhibit an evident *periodicity* of properties.

"2. Elements which are similar as regards their chemical properties have atomic weights which are either of nearly the same value (e. g., platinum, iridium, osmium) or which increase regularly (e. g., potassium, rubidium, caesium).

"3. The arrangement of the elements, or of groups of elements in the order of their atomic weights corresponds to their so-called *valencies* as well as, to some extent, to their distinctive chemical properties — as is apparent among other series in that of lithium, beryllium, boron, carbon, nitrogen, oxygen and fluorine.

"4. The elements which are the most widely diffused have *small* atomic weights.

"5. The *magnitude* of the atomic weight determines the character of the element just as the magnitude of the molecule determines the character of a compound body.

"6. We must expect the discovery of many yet *unknown* elements, for example, elements analogous to aluminium and silicon, whose atomic weight would be between 65 and 75.

"7. The atomic weight of an element may sometimes be amended by a knowledge of those of the contiguous elements. Thus, the atomic weight of tellurium must lie between 123 and 126, and cannot be 128.

"8. Certain characteristic properties of the elements can be foretold from their atomic weights."

In his Faraday Lecture, June 4th, 1889, he describes, in dramatic fashion, the verification of his predictions:—

"Before the promulgation of this law the chemical elements were mere fragmentary, incidental facts in Nature; there was no special reason to expect the discovery of new elements, and the new ones which were discovered from time to time appeared to be possessed of quite novel properties. The law of periodicity first enabled us to perceive undiscovered elements at a distance which formerly was inaccessible to chemical vision; and long ere they were discovered new elements appeared before our eyes possessed of a number of well-defined properties. We now know three cases of elements whose existence and properties were foreseen by the instrumentality of the periodic law. I need but mention the brilliant discovery of *gallium*, which proved to correspond to eka-aluminium of the periodic law, by

Lecoq de Boisbaudran; of *scandium*, corresponding to eka-boron, by Nilson; and of *germanium*, which proved to correspond in all respects to eka-silicon, by Winkler. When, in 1871, I described to the Russian Chemical Society the properties, clearly defined by the periodic law, which such elements ought to possess, I never hoped that I should live to mention their discovery to the Chemical Society of Great Britain as a confirmation of the exactitude and the generality of the periodic law. Now, that I have had the happiness of doing so, I unhesitatingly say that although greatly enlarging our vision, even now the periodic law needs further improvements in order that it may become a trustworthy instrument in further discoveries."

Since this time two hitherto unsuspected groups of elements have been discovered and proved capable of inclusion within the Periodic System: — the inert gases, affording a natural transition between the halogens and the alkali metals; and the radio-active elements, which for the most part long defied classification, but which now, thanks to Fajans and Soddy, constitute a further proof of the universality of the law. His attempt to introduce into the system the hypothetical element coronium with an atomic weight of 0.4, and the "ether" of the physicist with the atomic weight of 0.000000000053 have scarcely found acceptance, especially since Moseley's calculation of atomic numbers has indicated that hydrogen has the smallest atomic weight of any element.

Two of his fundamental ideas in connection with the Periodic System remain open to question: First, his repugnance to the doctrine of the unity of matter; second, his contention that the elements, if arranged periodically, must follow inexorably in the order of the atomic weights. He lived to see many atomic weights revised so as to conform to this principle, and died with the conviction that tellurium, for instance, must have a lower atomic weight than iodine. The discovery of isotopy makes this outcome still a possibility.

Mendeléeff, given up by the doctors to die at an early age, lived in activity and usefulness to the age of seventy-three. The summer before his death, weakened by influenza, he began to put his affairs in order, but he retained his vigor of mind and his interest in current events up to the last. The Orthodox Church, the Czar, and the educational institutions of St. Petersburg rendered his memory extraordinary honors as he was borne out to be laid beside his mother and his favorite son. Count Witte well characterized his services when he said: — "In him Russia lost her pride, the great scholar and the upright patriot; industry lost its best adviser; the government a

notable helper, and we, his acquaintances and admirers, a loyal friend and the best of men."

Acknowledgement is made of the use of P. Walden's biography, *Ber. d. deutsch. chem. Ges., 41,* 4719 (1908) and of W. A. Tilden's Memorial Lecture, *Jour. Chem. Soc., 95*[2], 2077 (1909). These papers contained material otherwise inaccessible.

GEORGE SHANNON FORBES.

SIR JOHN MURRAY (1841–1914)

Foreign Honorary Member in Class II, Section 1, 1900.

Sir John Murray, the son of Scotch settlers in Canada, was born at Coburg, Ontario, on March 3d, 1841. There he passed the first seventeen years of his life. In the primitive conditions of a new community the natural robustness of his nature found a free development in congenial soil.

In 1858 he came to Edinburgh where he prepared for its University at the Stirling High School. His career at the University appears to have been stamped by some of the qualities that distinguished him in after life. Impatient of dogmatic authority, he was somewhat scornful of inherited tradition, and treated his prescribed studies with a cheerful sans gêne. For even in those days he desired to find out things for himself, and delve for knowledge independently. The capacity of clear and original thought, with a genius of disentangling the heart of a subject from its enveloping details, was as characteristic of the youth as of the man. From the small circle of scientific men who then made Edinburgh famous, he gathered, during his student days, what was most worth having, and went his way. That one of the facets of his personality drew him into a friendship with Louis Stevenson, offers a suggestive glimpse into a by-way of his character.

After continuing his scientific training for a period of several years at Bridge of Allen; he undertook a hazardous voyage to Spitzburgen, in a Peterhead whaler in 1868, to study the Arctic Sea. This was the initial exploit that marked him as a pioneer in Oceanography. With the history of the development of this science his

name is inextricably bound as a recognized leader. The work of Pourtalès, in 1867–1869, off the Florida coast in the Corwin and Bibb, had stimulated among scientific men the interest in deep sea exploration. This was further aroused by several English expeditions under the joint charge of Thomson, Carpenter and Jeffreys.

When, in December, 1872, the Challenger set out on her famous voyage, under the leadership of Sir Wyville Thomson, to explore the oceans of the world, Murray was appointed one of the three principal assistants. On the return of the Challenger from her cruise of nearly four years, he was made chief assistant in the colossal labor of publishing the Reports of the expedition. At the death of Sir Wyville Thomson in 1882, it was freely predicted that the work would never be finished. But Murray was appointed editor, rose superior to all obstacles and vicissitudes, and finally brought the enterprise to a successful conclusion by issuing the last of the fifty volumes in 1895.

He will probably be best remembered by his work in connection with the Challenger Expedition. The labor of editing the Reports was one of which the difficulty has perhaps not been fully realized. It could never have been completed without first class powers of organization and great determination of purpose. And it required skill and tact of the highest order to keep in hand the small army of specialists who were working on the reports in every quarter of the globe. Not the least of his troubles were his constant struggles to extract money from a grudging Treasury, that felt its patience sorely tried by the length and expense of the undertaking. At one stage of the proceedings Murray forced the Government to produce the necessary funds by threatening to finish the work at his own personal expense.

Murray used to say that he was the only man who had read every word of all the volumes. To carefully read all the page proof was in itself no light task.

With the assistance of Renard of the University of Ghent, he himself studied the deep sea deposits collected by the expedition. The result of this work was published as one of the volumes of the Report. This gave to science the first minute description of the deposits on the bed of the ocean, and disclosed the extreme slowness with which some of them are accumulating.

His active mind gave him a wide sympathy for many scientific activities. Among the several fields in which his services to science were important, should be mentioned his bathymetrical survey of the fresh-water locks of Scotland. This work he conducted for many years with a capable corps of observers. These investigations were

published in a series of six volumes, finished in 1910. This is probably the most complete work of its kind in existence.

Chiefly for the purpose of testing in deep water various new apparatus which had lately been used in shallow seas, Murray organized an oceanographic expedition to the North Atlantic in 1910, under the auspices of the Norwegian Government. He financed this enterprise himself, with the exception of the salaries of the government assistants, who were in charge of Dr. Johan Hjort. In his capacity of promoter and advisor of the cruise, Murray was cooped up and tossed about for several months, when nearly seventy, in the uncomfortable little steamer Michael Sars; a hardship that he made light of, for he loved the ocean which he knew so well.

In 1912 Murray and Dr. Hjort collected the results of the voyage in a volume entitled "The Depths of the Ocean." This publication, a valuable reference-book on thalassography, contains a complete summary of oceanography, it treats of the apparatus, the manner of its use and the ends reached in this science; while it brings the whole subject up to date with a description of the work accomplished by the Michael Sars.

To commemorate the memory of a close friendship, Murray gave a fund to the National Academy at Washington, establishing the Alexander Agassiz Medal, which is to be awarded occasionally for distinguished work in Oceanography. On the occurrence of its first award in 1913, the Academy adopted the following course. They selected Dr. Hjort for the honor, and sent a replica of the Medal to Murray.

It is hoped that at the end of the present war, a similar tribute can be offered through The Royal Society, which will establish a Sir John Murray Medal.

The Zoölogical stations on the Firth of Forth and on the Firth of Clyde were founded by him. It was in part due to his efforts that the meteorological observatory on Ben Nevis was created.

He took a keen interest in Polar Exploration, and made a journey to Norway for the express purpose of seeing Nansen start on his attempt to reach the North Pole. He first suggested the idea that the land around the South Pole is one continuous continent, which the explorations of Scott and Amundsen have done much to substantiate. The stimulus that Antarctic research received from Murray's enthusiastic support, was a powerful factor in materializing at least one of those expeditions.

Murray was the authority on deep sea deposits. Many of the

numerous explorers who, since the days of the Challenger, have probed the depths of the ocean, placed their collections of muds and slimes at his disposal for study and description. His familiarity with this subject led him to think there are no rocks on continental areas that could have been formed from such deposits as the red clays, the pteropod and the Globigerina oozes, which cover vast areas of the ocean's floor, where they have been accumulating for long periods of geological time. This led him to the firm belief that the ocean basins have remained fixed since the early ages of geology, and to a disbelief in those lost Atlantes and elevated pathways called on to explain the geographical distribution of land flora and fauna. Nor did he admit that Australia, India, Africa, South America and Antarctica had ever formed a single continent.

Murray very naturally considered that the pendulum and geodetic. observations of late years, as well as measurements of gravity over the ocean, attest the permanence of the ocean basins. "For," as he wrote to a friend not long before his death, "it is extremely improbable that there could be such a shifting of materials in the deeper parts of the crust as to cause sub-oceanic heaviness to give place to sub-continental lightness — such as now is found to exist."

He insisted that abyssal Radiolarian ooze was a different deposit from those that have formed Radiolarian rocks. Although Molengraaff, in his recent papers on the Danau formation, dissents from this view, he believes in the permanence of continents and ocean basins. For he considers that the theory is supported by the rarity of the Radiolarites, and the fact of their being limited to the geosynclinals; that is to the more mobile portions of the earth's crust, which in broader or narrower strips separate the great stable areas.

In common with most naturalists who since Dana's day have examined coral reefs in the field, Murray returned from the voyage of the Challenger convinced that Darwin's theory of subsidence did not satisfactorily explain the formation of coral atolls and barrier reefs. Murray's theory lays special stress on the building up of marine platforms, by the gradual deposit of the remains of marine organisms, to a suitable height for the growth of reef building corals; and to the seaward growth of corals on the talus, broken from the living reef and rolled down its outer slope. The formation of the lagoons of atolls and the passages between barrier reefs and the land he attributed to the solvent action of sea water.

When Murray, then a comparatively young man, first suggested his theory, he was advised not to publish anything hastily. This

delayed its appearance for about two years. The Duke of Argyll, learning of this fact, wrote accusing the scientific world of a deliberate attempt to suppress the truth for fear of injuring the prestige of Darwin. This called forth the indignant protest of Huxley. The controversy, which created a considerable commotion among the scientific men of that day, was known as the "Conspiracy of Silence."

Murray maintained that the famous coral boring on the Atoll of Funafuti in the Ellice Islands, made under the auspices of the Royal Society of London, supported his views. In fact he predicted that the diamond drill would penetrate into a talus. It might have been inferred from this prophecy that the core taken from Funafuti would lead to a discussion of what it actually revealed. A site for the hole should have been selected where, if, as many believe, the theory of subsidence is mistaken, the drill would have encountered only a comparatively thin stratum of coral rock. Such a site might be found at some point a short distance from the centre of a lagoon, but even there the evidence would not be conclusive if the atoll happened to rest on a foundation of limestone. The situation chosen for the Funafuti bore, on the rim of a large atoll, was unfortunate, and the work instead of proving anything has complicated the subject; for eminent men have drawn very different conclusions from the results of the undertaking. Distinguished supporters of Darwin's theory of subsidence have held that the drill pierced a continuous coral reef. Murray believed it "passed through a portion of the talus produced by the fragments torn from the growing face of the reef, and on which it had proceeded seawards." While Alexander Agassiz was inclined to think that the drill passed in part through Tertiary limestones, and in part through a talus of modern material.

The theories of Murray, Agassiz, and Gardiner differ in the amount of work that they attribute to modern corals, and the relative values they assign to such agencies as organic deposits, erosion, solution, the trade winds, and the scouring force of the ocean. But they all agree in asserting that Darwin's theory of subsidence does not offer a satisfactory solution of the method of formation of atolls and barrier reefs.

One episode in Murray's life furnishes a good example of the unexpected practical benefits that may result from the pursuit of pure science. While cruising in the regions adjacent to the island of Java, the nets of the Challenger collected some bits of phosphate. A careful examination of these objects convinced Murray that they must have been formed on land. Subsequent search for their origin, under Murray's auspices, led to the discovery of the phosphate deposits of

Christmas Island. The island was annexed to Great Britain, and a company under Murray's presidency developed a highly prosperous mine. Some years before his death the company had already paid in royalties, for the protection of the English flag, more than the entire cost of the Challenger expedition!

This enterprise made Murray rich, and while he accepted the opportunities which the possession of wealth offers to an intelligent man, it in no way affected his interest in the pursuit of science. One of the chief projects of his last years was to equip a vessel on the lines of the Prince of Monaco's "Princesse Alice," and set out in her for a protracted cruise around the world in the interest of oceanography.

Murray was elected a Foreign Honorary Member of the American Academy in 1900. Among the many other honors that came to him in recognition of his scientific work, he received the Prussian order 'Pour le Mérite. Punch celebrated the event with a cartoon, which always delighted Murray. As the final decision in the award rests with the King of Prussia, the picture represents the Kaiser who has called for the publications of the candidate. Vistas of lackeys are staggering in loaded with the mighty volumes of the Challenger Report, while the astonished monarch asks in amazement why the name of this prolific author had not been previously suggested.

Under a somewhat brusque manner, Murray could not conceal a genial kindliness, and deep human sympathy and interest. His devotion to research was combined with a strength of will and a steadfastness of purpose, that rendered him singularly efficient in anything he undertook, whether scientific or practical; for he had an unusually clear and steady vision in worldly affairs, uncommon in the devotee of pure science.

His connection with the Challenger Reports began a wide acquaintance among scientific men; his business interests in Christmas Island, Canada, and the United States threw him in broad touch with a different world. Accustomed to meet many varieties of people, the readiness with which his keen and active mind struck fire in contact with other men, made him, wherever he went, a commanding figure.

Murray had little sympathy for those whom he termed the hod carriers of science. Men whose mental activities seem to be satisfied in collecting undigested facts. Not that he undervalued facts, but that he strove to fit them into the body of human knowledge. He never lost sight of the aim of science, a deeper insight into Nature, and a broader outlook on the Universe.

In 1889 Murray married Isabel Henderson, daughter of Thomas

Henderson the shipowner, and brought his wife back to Edinburgh, where their home became one of its intellectual centres. For many years of his later life, Sir John and Lady Murray, with their family of two boys and three girls, lived in a roomy house on the outskirts of Edinburgh, which he had christened "Challenger Lodge." It was characteristic of the man that his unfailing insight enabled him to established a most sympathetic relation with his children, and caused him to use original methods, based on great independence and liberty, to develop them into efficient and self reliant personalities.

Turning into his own avenue, on March 16, 1914, Murray's automobile skidded and capsized, killing him instantly. Such an end, always wished for by him, came as a shock to his friends in many lands, whose admiration for the naturalist was only exceeded by their love of a very human fellow-man.

G. R. Agassiz.

ANDREW HOWLAND RUSSELL (1846–1915)

Fellow in Class I, Section 4, 1892.

Andrew Howland Russell was born in Plymouth, Massachusetts, on the 24th of December, 1846. His father, Andrew Leach Russell, and his mother, Hannah White Davis, were both of the old Pilgrim stock. He was educated first in the public schools of Plymouth, then spend two or three years at Philips Exeter Academy. In 1865 he was one of the first class to enter the Massachusetts Institute of Technology, but did not complete the course because in 1867 he received an appointment to the Military Academy from which he was graduated fourth in his class in 1871.

He was then promoted to Second Lieutenant in the Third Cavalry, in 1876 to First Lieutenant of Ordnance, in 1888 to Captain, 1901 to Major, 1895 to Lieutenant Colonel, 1907 to Colonel. From July to November, 1898, he held a Volunteer Commission as Major and Chief Ordnance Officer; from 1901 to 1904, he was Chief Ordnance Officer of the Division of the Philippines with the rank of Lieutenant Colonel.

As a Cavalry Officer, in 1871–1872, he served with his regiment in Arizona and Nebraska; in 1873–1874 on the Wheeler Expedition for Surveys west of the 100th Meridian, in New Mexico, Colorado and

Arizona. In 1874–1876, at the Military Academy at West Point as instructor in Natural Philosophy, Astronomy, Ordnance Mineralogy and Geology.

As an Ordnance Officer, he served from time to time at Watertown, Rock Island, Benicia, Fort Union and Frankfort Arsenals, at Vancouver Ordnance Depot; as Inspector of Ordnance in Boston, Providence and St. Paul, as Chief Ordnance Officer of the Department of the Columbia and of the Philippines, and as Assistant to the Chief of Ordnance in Washington, D. C. At the Centennial Exposition of 1887–1888 at Cincinnati, he had charge of the War Department Exhibit, in that of 1892–1893 at Chicago, of the Ordnance Exhibit.

All of this service was in many respects congenial, and favorable to the natural bent of his disposition. His transfer to the Ordnance gave him a good opportunity to exercise his ingenuity; and there was scarcely a branch of the work of that department in which he did not suggest useful improvements, some of which were adopted by the government at the time, and others after their value had been demonstrated in action by the armies of foreign nations.

In 1875, while still a Lieutenant of Cavalry, he invented an hydraulic buffer for checking the recoil of a gun on its carriage, afterwards known throughout the world under the name of Vavasseur. Colonel Russell not only antidated Vavasseur in this matter, but appears to be the pioneer in the field of modern gun carriage recoil systems. He obtained patents at home and abroad for a great number of ingenious devices relating to guns and their auxiliary appliances, which make the artillery of to-day so much more effective than before.

But the object to which he devoted the most labor and study was the improvement of small arms. His ingenuity suggested devices by which one musket could be made to do the work of several. In 1876, he invented devices for loading and firing rapidly, and made wooden models to illustrate their action; but they found little favor with "practical" military men who regarded them as more curious than useful, and most objectionable from sound military considerations. Soon after, he met Capt. W. R. Livermore who showed him designs and models so nearly like his own that at Russell's suggestion they decided to combine their efforts.

In 1878, a Board was convened at Springfield to test Magazine Guns. By that time the prejudice against magazines was so far modified that many officers were willing to try them provided the magazine was reserved for the final charge. The Hotchkiss Gun operated by a bolt, and with a tubular magazine in the breech was most favored. Russell and Livermore presented to the Board a

wooden model of their device as applied to a Hotchkiss Magazine, and at the same time, prepared drawings of their own devices which dispensed with the tube and had a fixed box magazine under the receiver of the gun. In each case the cartridges were placed side by side in the box magazine into which they could be loaded either singly or all together, by a single motion. Five or six cartridges were carried side by side in a clip for this purpose. The clips were to be carried in the belt or in the cartridge box. The inventors explained how, for the most rapid fire, the magazine could be replaced by a belt and the piece fired like a machine gun, and how the principles could be applied to guns of all calibres.

Edward W. Byrn, describing "The Progress of Invention in the Nineteenth Century," says,

"This idea was subsequently developed by Livermore and Russell in Patent No. 230, 823, August 3, 1880, and this feature, viewed in the light of the importance subsequently attained by the "clip" in the Mauser and Mannlicher guns, may be fairly considered the pioneer of this idea of grouping cartridges in made-up packets for bolt guns. Its great advantage is the large number of shot that may be fired in a short space of time without an excessive weight in the gun itself." "Before the United States Army Gun Board of 1882, Livermore and Russell submitted a completed gun for trial in which the magazine was placed at the side of the receiver, extending downward, and was arranged to be filled through a side gate at the top from a cartridge package or "clip" grasped in the hand, and applied to the mouth of the magazine for stripping the cartridges from the clip into the magazine. This system also contemplated the use of a clip with a central as well as with a side magazine." . . .

The gun with some changes was tested before the Army Board of 1892 and the Navy Board of 1895. When the inventors explained that they had fired sixty aimed shots from their musket in a minute, a member of one of the Boards said that that alone was enough to condemn it, as even with muzzle-loaders soldiers often exhausted their ammunition.

Russell and Livermore also invented guns with straight pulling bolts and with automatic action. The United States Government adopted the Clip System in the construction of the musket now in use, although not until many other nations following the lead of Germany had already adopted it.

General Bernhardi writing a few years ago upon how Germany makes war (p. 58) says:—

"With the adoption of small calibre and clip-magazine, as well as

with the introduction of smokeless powder, and of pointed projectiles, the development seems to have reached a certain climax and to have come to a finish for the time being.... The character of fighting has altogether changed."

In 1908, having served over forty years he applied to be placed on the retired list. In approving his application, the Chief of Ordnance spoke in highest terms of his ability, good judgment and devotion to duty, especially while acting as Chief of Ordnance for several months, saying that his reports of the Ordnance Exhibits at the Cincinnati and Chicago Exhibitions had been valuable contributions to the service, and adding;—

"Colonel Russell has also a very substantial claim to the inception and first presentation of the modern clip system of loading magazine guns, almost universally applied to the small arms of to-day. The original gun, embodying this feature, presented by him and Col. W. R. Livermore, U. S. A. before the United States Magazine Gun Board of 1882 is in this office. Several other inventions of Col. Russell's have been embodied in Ordnance Constructions, but without pecuniary compensation to him. The Department and the Army are indebted to him for efficient services."

After retiring from active service he travelled in Europe for about a year and then moved back to Plymouth where he died on the 16th of June, 1915.

It was a bitter disappointment that his own country had not been the first to adopt his inventions; but on his death bed was gratified to realize that the great war waging in Europe had demonstrated beyond question the truth of the principles for which he had fought so long; that one nation after another had adopted the system of guns of which he was a recognized pioneer, that the effect of their fire was all that had been claimed, and that warfare had taken the form which had been predicted.

His name will long be remembered in the history of firearms and especially of their development during the past forty years.

W. R. LIVERMORE.

THOMAS DAY SEYMOUR (1848–1907)

Fellow of Class III, Section 2, 1900.

Thomas Day Seymour was born in Hudson, Ohio, on April 1, 1848, and died in New Haven on December 31, 1907. He felt just pride in his ancestry. His father, Nathan Perkins Seymour, was the sixth descendant in direct line of Richard Seymour, a Devonshire man, who emigrated and settled in Hartford in 1639, and became the ancestor of many distinguished men in New York and Connecticut. His mother, Elizabeth, was the daughter of Thomas Day of Hartford, for twenty-six years Secretary of the State of Connecticut, and niece of President Jeremiah Day of Yale College.

Seymour's father graduated from Yale in 1834 and was tutor there for four years. In 1840 he accepted the professorship of Greek and Latin in Western Reserve College, then in Hudson. Here the younger Seymour passed his boyhood, was fitted for college, spent four years as an undergraduate, and, after two years in Europe, taught for eight years. In 1874 he married Sarah, daughter of Henry L. Hitchcock, then President of Western Reserve. His widow and a son and two daughters still survive him.

While in Hudson, Seymour had free access to his father's library, which contained between two and three thousand carefully selected volumes, and is said to have been, at one time, the best library west of the Alleghanies. The ties that bound father and son were intimate and tender. The elder Seymour was a man of refined and gentle nature, an excellent classical scholar, and possessed also of a knowledge of the German, French and Italian languages that was then unusual. The son was a quiet and reserved, but happy, boy, who went singing and whistling about the house. It is related that he was "a great worker, with a passion for accuracy." He entered college in the autumn of 1866, maintained the rank of first scholar, and at graduation was valedictorian of his class, but he found leisure for other interests. "He was no more a recluse then," a classmate writes, "than subsequently. Nobody was in closer touch with the whole body of students."

The elder Seymour resigned his professorship in Western Reserve College in 1870, and Thomas Seymour was then elected professor of Greek there, with leave of absence for two years. He went to Europe and studied in Leipsic and Berlin for a year and a half. In the spring

of 1872 he was in Italy and Greece. During his first semester abroad he came, with rare independence, to the grave decision not to stand for the doctorate in philosophy. He could not spare time, he said, to make special investigations, embody them in a thesis, and prepare himself for examination in certain subjects that he did not think it was profitable for him to study. Later in life he was honored by great universities with the degree of Doctor of Laws: Western Reserve in 1894, Glasgow in 1901, and Harvard in 1906. He was elected to membership in the American Academy of Arts and Sciences (Class III, Section 2) in May, 1900.

In 1880 he was called to Yale, and in 1884, on the death of Professor Lewis Packard, he was elected Hillhouse Professor of Greek. The range of his teaching during his twenty-seven years in New Haven was remarkable. Undergraduates read with him in elective courses Homer, Pindar and the lyric fragments, Greek Tragedy, Thucydides, Plato and Aristotle, Demosthenes and Isocrates, Theocritus, and the Septuagint and the New Testament. The subjects offered to graduate students were epic poetry, lyric poetry, the Greek historians, the drama, Plato, the orators, the bucolic poets, the Greek dialects, Greek inscriptions, and the history and encyclopedia of Greek studies. Aeschylus engaged his interest deeply, Plato was his constant companion. He carried some part of the text of Plato with him when he travelled and read him wherever he happened to be. His studies in Greek oratory were quickened by the investigations of Friedrich Blass, his intimate friend for more than twenty years. The two scholars were singularly alike in many ways: unostentatious in their lives; unwearied in study; impatient of error; accurate, learned, and fruitful. Seymour, like his father was a student of the Bible. This was his other constant companion. In teaching it he applied, with due regard to the change in period, precisely the canons of interpretation that he had found valid in his study of the Greek orators. He was an indefatigable worker. One year he taught twenty-four hours each week, and the hours for one of the courses were from ten o'clock until midnight. The five graduate students in this course eventually succumbed, and he reluctantly changed the time to eight o'clock. When the students withdrew at ten, he cheerily bade them good-night and turned to other occupations. One of his colleagues speaks of his "joyous industry." The tale is current that he never refused service on a committee — and that, too, although member of a faculty that has the envied reputation of initiating and executing policies of its own. Nor was he idle in the summer time — he was never idle. He

gave two summer courses of lectures in Chautauqua, one in Chicago, another in California.

Notwithstanding his devotion to his college duties, he found much time for writing. He presented fifteen papers at sessions of the American Philological Association. When president of the Association, he chose as the subject of his address 'Philological Study in America.' He was one of the editors of the Classical Review, published in London, and an editor, also, of the College Series of Greek Authors. He wrote three of the volumes in this series, revised another, and put twelve others through the press. He published his first book in 1882, an excellent edition of Select Odes of Pindar. Men always interested him, ancient or modern, and in 1888 he published in the *Chautauquan* a series of studies of nine characters illustrious in the annals of Greece. He was the best Homeric scholar that America has produced. His contributions to the study and interpretation of Homer were numerous and diverse, editions of parts of the poems for use in school and college, an introduction to the language and verse of Homer, reviews and original articles in journals, and finally his *Life in the Homeric Age*, published shortly before his death, his largest single contribution to knowledge, and that on which his fame as scholar and expositor will chiefly and securely rest.

The introduction of elective studies in American colleges compelled sharp attention to methods of teaching in all departments of knowledge. On none was the effect more immediate than on that of the classics. It soon became apparent that the best and broadest provision of training for teachers in this subject must include study in Greece and Italy. The Archaeological Institute of America was founded by Charles Norton in 1879, the American School of Classical Studies in Athens in 1881. Professor Seymour became the second chairman of the managing committee of the school in 1887, and held this influential but arduous position fourteen years. During his administration, the building occupied by the School was finished, the endowment was increased, the principle of a permanent directorship and of annual professorships was established, five volumes of papers were published, fellowships were founded, and important excavations were conducted; but the worthiest monument of his devotion to this cause is one hundred men and women that studied at the School during his time and are now nearly all teachers of the classics. He resigned the chairmanship of the managing committee of the School to become in 1903 the fourth president of the Archaeological Institute. This also is an arduous position, but Seymour had

acquired intimate knowledge of the history of the Institute and its affairs, and was personally acquainted with many scholars in all parts of the country. He had a rare gift for friendship. His administration of the Institute was eminently successful and he had large plans for the promotion of its growth and efficiency. He had expected to attend its annual meeting held in Chicago during the Christmas holidays of 1907, but he fell ill and died, while the Institute was in session, on the last day of the old year.

Thomas Seymour's life is an inspiring example of noble service and high achievement. Its controlling impulse was an ardent desire for knowledge, yet his activity was remarkably varied. He was not only a learned man who spoke with recognized authority, but also an earnest teacher, a wise adviser in college councils, a writer and editor of distinction, and an able administrator of important interests. His influence as a scholar steadily widened and strengthened as he grew older, and enhanced the reputation of Yale University as a great seat of learning.

He belonged to the finer and gentler type of scholars. He avoided fruitless controversy, but never shirked a duty. And thus it was that all who knew him loved him — for his candor, his modesty, his considerateness, his unselfishness, his unswerving devotion to truth.

JOHN WILLIAMS WHITE.

WILLIAM ROBERT WARE (1832–1915)

Fellow in Class III, Section 4, 1866.

In two important fields Professor Ware performed services of almost unique importance to his chosen profession of architecture. In the educational field he laid firmly the foundations of architectural training in this country; and in the field of active professional work he was largely instrumental in putting architectural competition on a dignified and secure basis which commanded the respect both of the building public and the profession. In both these fields he was a pioneer. That he was able to perform such signal service was due on the one hand to his attainments and character, and on the other to the fortunate circumstance that his active life fell in the formative period of

professional architectural growth in America, when his talents could most avail.

How well he builded in laying out the plan of architectural study at the Massachusetts Institute of Technology, when in 1865 he was called upon to organize what was practically the first school of architecture in the United States, is shown by the fact that this scheme, as shaped and modified in his hands, has stood the test of time, has shown itself admirably adapted to American needs, and is still the basis of the American method of architectural education. His wise foresight is revealed in the way this plan has shaped itself to meet the larger development of professional life which has come with the growth of the country.

One of the most difficult problems of professional ethics which American architects have been called upon to solve has been that of competition among themselves: how to avoid the injustice, and the waste of professional time and talent, which was the inevitable result of the informal, unregulated and uncompensated submission of competitive designs. Very early the American Institute of Architects (founded in 1857) and its affiliated professional bodies attacked this difficult question. Gradually, for the irregular and demoralizing scramble which was formerly common if not usual, has come to be substituted the formal, paid competition, subject to definite rules, controlled by a professional adviser and impartially decided by this adviser or in its later form by a professional jury. The submission of competitive sketches under other conditions is now regarded as unprofessional.

In the development and gradual improvement of this scheme Professor Ware's good judgment, far-sighted wisdom and absolute and universally recognized impartiality was invaluable. He was more often called upon to act as professional adviser in competitions than any other man, indeed nearly all the important competitions during his period of fullest activity came under his control, and he did more than any other one architect in securing the general recognition of, and the confidence of the building public in this form of regulation. His lucid reports and his fair mindedness and impartiality made the advantages of proper regulation and control so clear that his activity greatly tended toward the steady reduction in the number of badly regulated or unregulated competitions. At the same time while he recognized the advantage which the competition in certain cases offers to the owner and to the public and often on that account advocated it, his influence was always thrown against the competition when

it seemed unnecessary or inadvisable. His services to his profession in this field brought what was perhaps the most distinguished public recognition which came to him: his appointment in 1906 to represent America on the international jury of architects which was called upon to decide the world-competition for the Peace Palace at the Hague.

William Robert Ware was born at Cambridge, Massachusetts, on May 27th, 1832. He was the son of the Rev. Henry Ware, Jr. Ten years later the family moved to Framingham and in April, 1844, to Milton, to the home where on June 9th, 1915, he passed peacefully away. Here he attended the Milton Academy of which in later life he was one of the Trustees; but his health not being vigorous his mother sent him to England to the care of her cousin. He went alone and was gone six months. The journal which he then kept shows, even in the lad of fifteen, his taste and his independence of mind. It seems probable that this journey had its influence in turning him ultimately toward architecture, a career which gave scope both to the scientific bent of his mind and to his interest in the fine arts. On his return he went to the Phillips Exeter Academy and from there entered Harvard College as a member of the Class of 1852, and was elected to the Phi Beta Kappa. On graduation he taught school for two years in New York to support himself, and then entered the Lawrence Scientific School, graduating in engineering in 1856. Horace Porter, Prof. T. H. Safford, Prof. F. W. Putnam, Alexander Agassiz and Dr. William Watson, Secretary of the American Academy of Arts and Sciences, were among the students in the Lawrence Scientific School at this time. After that he studied his profession in the office of Mr. Richard M. Hunt of New York, one of the first American graduates of the Paris École des Beaux Arts. Mr. Hunt made of his office a sort of Atelier, and here young Ware found himself in the company of Henry Van Brunt, who was later to be his partner, of George B. Post and others who later attained prominence as architects. Mr. Hunt's office was certainly the first American 'atelier' and might almost be called the first American school of architecture. Later Mr. Ware entered in Boston the office of Mr. Edward C. Cabot whose scholarly and conscientious work, such as the Boston Athenaeum and the Boston Theatre, was distinctly the best then being done. When Mr. Ware was twenty-six or twenty-seven years of age he formed a partnership with Mr. Edward L. Philbrick and began his independent professional career. Together they carried out the railroad station at Worcester, architecturally one of the most important projects of the kind that had so far been built in this country. Its architectural form

was, of course, wholly due to Mr. Ware. For long it remained architecturally one of the most successful of American railroad stations and bore comparison with any of similar size that came into being much later. It has only recently been removed to give way to the present larger and more ambitious, but certainly, as a work of art, not more successful station. The dignified tower of Mr. Ware's Worcester station still stands. In 1860 Mr. Philbrick went to Europe and the brief partnership came to an end. Shortly thereafter Mr. Ware formed a partnership with his life-long friend Mr. Henry Van Brunt, a connection which lasted until 1881 when Mr. Ware went to New York. It is impossible to separate the part of the two friends in the many buildings which the firm carried out. Mr. Van Brunt's share in these designs tended to increase as Mr. Ware found his time more and more engrossed by educational work. Among the more important buildings which resulted from this partnership, Memorial Hall and Sanders Theatre in Cambridge, the First Church in Boston, and St. John's Church in Cambridge may be singled out. In 1865 Mr. Ware was invited to take charge of the Department of Architecture of the recently founded Massachusetts Institute of Technology and to formulate a course of professional study. In preparation for this unprecedented undertaking, Mr. Ware stipulated that he should first spend a year in Europe, examining schools of architecture and preparing himself for his new work. His association with Mr. Hunt naturally led him to think of the École des Beaux Arts in Paris, to which American students of architecture, in part through Mr. Hunt's influence, were already finding their way. But Mr. Ware found in another more modest Paris institution, the École Centrale d'Architecture, then conducted by its founder Mr. Trélat, a model which seemed to offer, especially in its association of liberal studies with professional training, suggestions better adapted to the needs of American students and to the conditions which had to be met at the Institute of Technology. But the advantages of the École des Beaux Arts were not overlooked and in 1871 Professor Ware secured the appointment of one of its distinguished graduates, Mr. Eugene Létang, to take charge of the work in Design. Mr. Létang proved a most sympathetic associate and continued to direct the work in architectural design at the Institute until his death in 1892. Meanwhile, Professor Ware had been called, in 1881, under most favorable conditions, to New York, to found a school of architecture at Columbia University, where he remained until 1903. He thus directly founded two of the prominent schools of architecture of the country, and as others came

into being his advice was eagerly sought and always generously given. There thus came to exist the pleasantest personal relations between Professor Ware, the Dean of architectural education in this country, and those in charge of other schools, several of whom had been his pupils. Constantly they went to him for advice, and he seemed to take as much interest in their schools as in his own, and was always eager to exchange experiences and to discuss plans. The generous devotion of his time to the interests of his friends and especially of his pupils, in whom his interest always continued, and with many of whom he kept in personal touch throughout their later careers, his ready sympathy, and his high character made him greatly beloved by all those who were privileged to come under his influence. His keen wit, a peculiar and very individual humor, and brilliant powers of conversation gave great charm to his companionship. His influence on his pupils was perhaps even more valuable in the upbuilding of character than in directly professional instruction.

Busy as Mr. Ware was both as teacher and practitioner, he still found time for a wide interest and activity in educational matters, especially where the Fine Arts were concerned. From 1875 until he went to New York in 1887 he was one of the trustees of the Museum of Fine Arts in Boston and was on the managing committee of the School of Drawing and Painting. He was similarly active at the Metropolitan Museum after he went to New York, and, for several years acted as Secretary of the Trustees of the American Academy of Fine Arts in Rome founded by Mr. McKim. The vacations nearly always found him at the old home in Milton with his sisters, and here he found time to write his exhaustive treatise on Perspective, and another on the theory of Shades and Shadows. Both of these were first published in "The American Architect." After his retirement in 1903, the latter was rewritten and enlarged for the Scranton correspondence schools. He also wrote and compiled an illustrated treatise on the orders for the use of schools of architecture, which he entitled "The American Vignola." The breadth of his interests is shown by his devising after his retirement an ingenious and entertaining method of Teaching Latin, which he conceived might be more directly taught than through the grammar. This he put into book form, but it was never published.

In 1883 he made a journey to Italy with his friend Mr. Wilder Bancroft, and in the year 1889 to 1890, with his sister Harriet, he visited Egypt stopping on the way at Gibraltar, Naples, Sicily and Malta. In the spring of 1890, the brother and sister spent some time

in Greece, visiting also Constantinople and the Dardanelles, travelling a part of the time with Professor and Mrs. Goodwin, and Professor (now President) and Mrs. A. Lawrence Lowell, returning home through Italy, France and England.

After his retirement he received the title of Emeritus Professor from Columbia University and settled permanently at Milton. In the spring of 1906, he was absent for eight weeks on his journey to the Hague as the American representative on the jury of the competition for the Peace Palace. On this journey also Miss Harriet Ware accompanied him. As his health declined he and his sister went south during two winters to avoid the coldest weather; but after 1910 such long journeys proved impossible, though he was still able to go away for change during the summer.

He was a Fellow of the American Institute of Architects and Honorary Corresponding Member of the Royal Institute of British Architects. In 1896 the high value of his work as pioneer in architectural education was recognized by the bestowal of the LL.D. degree from Harvard University.

H. L. WARREN.

WILLIAM WATSON (1884–1915)

Fellow in Class I, Section 4, 1864, Recording Secretary, 1884–1915.

William Watson was born at Nantucket, Mass., January 19, 1834. His parents were William and Mary (Macy) Watson.

He graduated from the Lawrence Scientific School, Harvard University with the degree S. B. in Engineering in 1857 and prolonged his study of mathematics during the following year. Throughout his undergraduate course he was distinguished for his mathematical ability and won the Boyden Prize in mathematics. He served as an instructor in the Calculus in Harvard from 1857 to 1859. Shortly thereafter he began a course of study at the University of Jena where he received the degree of Ph. D. in 1862. This was succeeded by further engineering study at the École des Ponts et Chaussées, Paris. In the years immediately following he made an extended examination of European technical schools his knowledge of which proved highly serviceable in connection with the laying out of the engineering courses

in the Massachusetts Institute of Technology then in process of organization.

He was elected to membership in this Academy February 9th, 1864 and in 1884 was chosen to fill the office of Recording Secretary. This he continued to hold up to the time of his death which occurred on September 30, 1915.

He was a staunch friend of the Academy and devoted to its interests. He realized very fully the desirability of a more general personal acquaintance among its members than formerly existed and was anxious to remove the frigidity which characterized its sessions in earlier times. To him was chiefly due the institution of the social features of the monthly meetings which have proved so successful.

Mr. Watson was one of the original professors in the Massachusetts Institute of Technology at its beginning, having in his charge the instruction in mechanical engineering together with descriptive geometry and stereotomy. Upon him devolved the planning of the Course in Mechanical Engineering under the conditions demanded for it in this country and also most of the teaching in its professional subjects as well, so few in number was the instructing force, a serious task for any man. To this work he devoted himself most earnestly sparing no pains to make his subject clear to classes of rather insufficiently prepared students. The lack of text-books in mechanical engineering based upon American practice hampered him greatly. His special interest, however, was in descriptive geometry and its applications of which he possessed a wide knowledge. To illustrate these he secured for the Institute what was for that time a remarkable collection of models of various surfaces. He also gave for the first time in the United States laboratory instruction in the practical applications of stereotomy, the students of which were required to construct actual models in plaster from their drawings. He retained his professorship until 1873 when he resigned to devote himself more exclusively to study. In the same year he married Miss Margaret Fiske of Boston who died a number of years later.

Professor Watson contributed much in an informal way to advance the interests of the many instructors in mathematics and physics in Harvard and Technology as a very active member of the Mathematical and Physical Club, or M. P. Club as it was colloquially called, an organization which from its beginning in the early eighties for over thirty years played a large part in bringing the older and the younger instructors at these institutions together for scientific discussion and friendly intercourse.

Professor Watson held many offices in connection with various engineering Congresses, among which were the Vienna Exposition of 1873, and the Paris Exposition of 1878. He was Honorary President of the Paris Congress of Architects and Vice President of the International Congress of Hygiene in 1878 and Honorary President of the Engineering Section of the French Association for the Advancement of Science for several terms. He was a member of the French Society of Civil Engineers, the French National Academy of Cherbourg, the American Society of Civil Engineers, the American Society of Mechanical Engineers and various other scientific and engineering organizations.

He was the author of several works on engineering subjects and of many technical papers.

CHARLES R. CROSS.

JAMES CLARKE WHITE (1833–1916)

Fellow in Class II, Section 3, 1866.

Dr. White was of Scotch-Irish stock, founders of Londonderry, New Hampshire, some of whom, moving to the Maine coast and mindful of their origin, called their place of settlement Belfast, another important Ulster town. Here, in 1833, our friend was born. One would not suspect that one of his great grandmothers was a Viennese, so characteristically Scotch-Irish were his qualities. It is perhaps well that he was one of a family of seven children, an education in itself. His father was shipbuilder, ship owner, manufacturer, bank president, a leader in all the activities of the town and the country round about.

James, fifth child and eldest son, took his A. B. at Harvard in 1853, member of a class prolific in professors, Charles W. Eliot, Justin Winsor, James Mills Pierce, Elbridge G. Cutler, Adams S. Hill, all of Harvard, John Quincy Adams, Fellow of the University. It is noteworthy that unconsciously he fitted himself during his boyhood and college years for the study of medicine. Without having decided as to his profession, he devoted himself to those preparatory studies now required of students entering that of medicine. In his undergraduate diary he wrote at the end of his junior year,— "I have done

much work outside the curriculum in natural history — botany and ornithology especially — fascinating studies under such teachers as Gray and Wyman." During vacations he shot and stuffed birds for the college Natural History Society. May 15, 1853, he wrote in his diary, "There came to me this afternoon in church the sudden conviction that I would choose medicine as my life work."

While a student in the Medical School he took special interest in chemistry, analyzed the Warren collection of urinary calculi, and wrote an essay based on that work which received the Boylston Society's prize.

In 1855 he served a year as medical house pupil at the Massachusetts General Hospital, and in August '56, went to Europe, choosing Vienna instead of Paris partly at the suggestion of Professor Calvin Ellis who had lately visited that city and recognized the advantages offered by the group of remarkable men then there active,— Oppolzer, Skoda, Rokitansky, and Hebra. In this step he showed a characteristic trait, that of doing his own thinking. Paris was then living on the medical glamour of the past. White was among the first to separate glamour from fact. After a year in Europe, a year which all who knew him are sure was filled with diligent purpose alike in purely professional and in general improvement, he settled in general practice in Boston. In dermatology and medical chemistry he had qualified himself especially. His character, his knowledge, and his readiness to use them fully wherever service could be rendered, met with prompt recognition. The memory of those Vienna days was kept alive by a club of six men who had studied there together,— Drs. Hay, H. K. Oliver, B. J. Jeffries, Hasket Derby, F. P. Sprague and J. C. White. They dined together regularly, and a photograph of the group occupied a prominent place on Dr. White's office wall.

In 1858 he was appointed instructor in chemistry and in 1866 adjunct professor thereof, often appearing in court as a medico-legal expert. He made it a rule to appear only for the government, a practice which, in combination with his obvious sincerity and competence, enhanced respect for the impartiality of his evidence. Meantime he was doing general practice and was visiting physician at the Massachusetts General Hospital, all the time increasing his knowledge, which in dermatology was greater than that of any contemporary in Boston. He soon found that there was ample exercise for his faculties in this branch alone. As thorough a man as he could not slur work, and he had to reconcile or decide between the rival claims of general practice, medical chemistry, and dermatology. To all of

these no one man, even fifty years ago could do justice. He chose dermatology, and he was appointed professor in '71, and cut himself off from all other practice. It required great courage in those days to specialize in dermatology; indeed, in anything except ophthalmology. But courage is a quality of which Dr. White had, at least, his share, and his integrity of character was so well known that all understood there was no sham in his adoption of a specialty. It seems a pity that so many present day specialists start as such, instead of growing into specialism as did White. Perhaps it is unavoidable, so intensively and extensively has knowledge opened up, above all in the last quarter of a century. The body is one, although its parts are many. General practice may be compared with the low power of the microscope. Dr. Owen Wister, of Philadelphia, remarked to the writer many years ago that "it takes a mighty big man to be a specialist." Dr. White was not what his great teacher, Hebra, used to call a "specialist by the grace of God." His specialism was based on a wide, general experience.

For a brief time he had a ward for skin cases at the Hospital, and toward the latter part of his life, a few beds for such cases. He built up a large out-patient clinic, frequented by many attracted by his reputation rather than that of the Hospital.

As a teacher, he was clear, practical, concise, convincing.

In the Faculty of the Harvard Medical School he rendered great service as a protagonist in the reform of Medical education in which Harvard led the van. It was not only in the Faculty that Dr. White pleaded the cause of improvement in medical education. It was the subject of his address opening the winter course of lectures in 1870, and again in his anniversary oration before the Massachusetts Medical Society, 1878.

He was one of the founders of the Boston Society of Natural History, serving as its curator of comparative anatomy for ten years. He was an original member and first President of the American Dermatological Association, and a very constant attendant and active participant in its meetings. He was again its President twenty years later. Proof of the recognition of his services and attainments is found in the fact that he was President of the International Dermatological Congress held in New York in 1907. In the Massachusetts Medical Society he was Anniversary Chairman, Orator, and President. He was for some years Editor of the Boston Medical and Surgical Journal. His contributions to literature were mainly papers, especially on subjects related to diseases of the skin.

His book on "Dermatitis Venenata," published in 1887, covered ground hitherto but little cultivated.

After his retirement from the Hospital and Medical School, he published privately "Sketches from my Life," containing his diaries while at Cambridge and in the Medical School. He also printed privately a sketch of the Clarke-White family.

He was a methodical and very industrious man, well read generally, a connoisseur in food, wine, and china. Rarely sleeping after six, he read for an hour before rising. Every summer he made a list of birds seen, and, during a visit to the writer in the Adirondacks, a list of all the berry bearing plants he encountered in the woods.

The last years of his life he passed the months of June to October at Islesboro in Penobscot Bay. His white house was on the crest of a ridge one hundred feet above the water, and contained collections of books, china, furniture, and pictures, which gave him great enjoyment, alike in collecting and in owning. The cupola, to which he liked to lead the way, commanded both east and west bays, and more than twenty towns, among them Belfast, his birthplace, some ten miles away. On his west porch he passed much time, delighting in the everchanging views of the Camden Hills, and the activities of Gilkey Harbor. No yacht entered or left unnoted by him. Many friends will cherish many memories of this porch, and regret that memories alone remain for them.

Of sentiment he rarely talked, but he had it abundantly.

Some we call good are so negatively, rather than positively. Not so Dr. White. Virile, fearless, aggressive, he was a good fighting man, good man of medicine, good citizen, good friend. An unusual degree of these by no means synonymous forms of goodness was happily and rarely blended in him.

He was a knight, sans peur et sans reproche. In life he stood for all that is best. Is there any better preparation for death, anything which one of us could more wish said of him? Let us honor him by striving to follow his example.

F. C. Shattuck.

CHARLES OTIS WHITMAN (1843–1910)

Fellow in Class II, Section 3, 1890.

Charles Otis Whitman was born December 12th, 1843[2] at Pinhook, town of Woodstock, Maine, the son of Joseph and Marcia (Leonard) Whitman. He early showed a love of natural history and was especially interested in birds. He graduated from Bowdoin College (B.A.) July, 1868, having been obliged to teach meantime to secure funds for his education. He was for four years principal of the Academy at Westford, Massachusetts and, in September 1872, was appointed submaster at the English High School in Boston where his uncle, George F. Leonard, had been for some years master. He came under the influence of Louis Agassiz in 1873 and entered the laboratory at Penikese. There he met Professor E. S. Morse who was struck by his ability. He went to the Naples Laboratory and studied at Leipzig under Leuckhart, graduating (Ph.D.) in 1878. His doctor's thesis on "The Embryology of Clepsine" introduced new principles, as well as facts, into embryological science, and was beautifully illustrated by his own drawings.

Returning to America he was invited in the summer of 1879 by Professor Morse to take up the work Morse was laying down at the Imperial University, Japan. Accordingly Professor Whitman taught zoölogy at Tokyo until the summer of 1881. Here he trained four investigators, all of whom became professors of zoölogy at the university. Becoming estranged from the University officials because he could not adapt himself to their ideas of official control of intellectual property, he left Japan in August 1881. He went to Naples where he studied from November, 1881 to May, 1882. Here he worked out the embryology, life history and classification of Dicyemids, using the newest methods of microscopical research. Returning to America in the autumn of 1882 he was appointed Assistant in Zoölogy at the Museum of Comparative Zoölogy of Harvard University. Here he worked in coöperation with Alexander Agassiz on the development of pelagic fish eggs. Two papers were published on this subject and his own book on "Methods of Research in Microscopical Anatomy and Embryology" appeared at this time. Whitman was put in charge of a private laboratory for biology and related research, founded by

[2] The date December 14, 1842 is also given.

Mr. Edward Phelps Allis, Jr., on the lake at Milwaukee, Wisconsin. While here he launched the Journal of Morphology, characterized by the scholastic and artistic excellence of its contributions. In 1888 Professor Whitman accepted the invitation of the Trustees of the newly organized Marine Biological Laboratory to become its director. This laboratory he developed with extraordinary success during 21 years. It was during the early years of the laboratory that the technical scientific society now called the American Society of Zoölogists was founded, largely through his initiative. In 1889 Whitman was called to Clark University as professor of zoölogy. He removed in 1892 to the new University of Chicago where he and his associates developed a large school of zoölogical research. For a period of fifteen years Whitman bred pigeons to get at an understanding of the evolution of their color markings. He paid particular attention to the phylogeny of pigeons, instinct and animal behavior, infertility and the nature of sex. Caring for his pigeons he contracted a heavy cold and died suddenly of pneumonia on March sixth, 1910, at the age of 67. His principal biographer records 67 titles of publications of which 7 are his annual reports. The others are brief notices of technical methods, a few are polemical, 9 are of a semi-popular sort relating to the work and aims of the biological laboratory. A number are brief essays chiefly upon philosophical-biological matters, such as "The seat of formative and regenerative energy," 1887; "The naturalist's occupation," 1891; "The inadequacy of the cell theory of development," 1893; "General physiology and its relation to morphology," 1893; "Evolution and epigenesis," 1895; "Bonnet's theory of evolution; a system of negations," also "The palingenesia and the germ doctrine of Bonnet," 1895; "Animal behavior," 1899; "Myths in animal psychology," 1899. The more strictly investigational papers fall into three periods; 1. The invertebrate period devoted chiefly to the leech and to Dicyemids. 2. The period of vertebrate embryology, including especially work on pelagic fish eggs, on amphibian eggs and the ganoid fish, Amia. 3. The period of genetics, foreshadowed in his note "Artificial production of variation in types," 1892, and continued with the pigeons to the end, 1910,— in all 18 years. While the quantity of his published work is not great it is mostly characterized by fine literary style, scientific accuracy and philosophic insight.

CHAS. B. DAVENPORT.

American Academy of Arts and Sciences

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Frederick Eugene Wright . . . . . Washington, D. C.

CLASS II., SECTION II.— *Botany*.— 31.

Oakes Ames . . . . . North Easton
Irving Widmer Bailey . . . . . Cambridge
Liberty Hyde Bailey . . . . . Ithaca, N. Y.
Douglas Houghton Campbell . . . . . Palo Alto, Cal.
George Perkins Clinton . . . . . New Haven, Conn.
Frank Shipley Collins . . . . . North Eastham
John Merle Coulter . . . . . Chicago, Ill.
Edward Murray East . . . . . Jamaica Plain
Alexander William Evans . . . . . New Haven, Conn.
William Gilson Farlow . . . . . Cambridge
Charles Edward Faxon . . . . . Jamaica Plain
Merritt Lyndon Fernald . . . . . Cambridge
George Lincoln Goodale . . . . . Cambridge
Robert Almer Harper . . . . . New York, N. Y.
John George Jack . . . . . East Walpole
Edward Charles Jeffrey . . . . . Cambridge
Fred Dayton Lambert . . . . . Tufts College
Burton Edward Livingston . . . . . Baltimore, Md.
George Richard Lyman . . . . . Washington, D. C.
Winthrop John Vanleuven Osterhout . . . . . Cambridge
Alfred Rehder . . . . . Jamaica Plain
Lincoln Ware Riddle . . . . . Wellesley

Benjamin Lincoln Robinson . . . . . Cambridge
Charles Sprague Sargent . . . . . Brookline
William Albert Setchell . . . . . Berkeley, Cal.
Arthur Bliss Seymour . . . . . Cambridge
Erwin Frink Smith . . . . . Washington, D. C.
John Donnell Smith . . . . . Baltimore, Md.
William Codman Sturgis . . . . . Boston
Roland Thaxter . . . . . Cambridge
William Trelease . . . . . Urbana, Ill.

CLASS II., SECTION III.— *Zoölogy and Physiology.*— 53.

Glover Morrill Allen . . . . . Boston
Joel Asaph Allen . . . . . New York, N. Y.
John Wallace Baird . . . . . Worcester
Thomas Barbour . . . . . Boston
Francis Gano Benedict . . . . . Boston
Henry Bryant Bigelow . . . . . Concord
Robert Payne Bigelow . . . . . Brookline
John Lewis Bremer . . . . . Boston
William Brewster . . . . . Cambridge
Charles Thomas Brues . . . . . Boston
Hermon Carey Bumpus . . . . . Tufts College
Walter Bradford Cannon . . . . . Cambridge
William Ernest Castle . . . . . Belmont
Charles Value Chapin . . . . . Providence, R. I.
Samuel Fessenden Clarke . . . . . Williamstown
Edwin Grant Conklin . . . . . Princeton, N. J.
William Thomas Councilman . . . . . Boston
Joseph Augustine Cushman . . . . . Sharon
William Healey Dall . . . . . Washington, D. C.
Charles Benedict Davenport . . . . Cold Spring Harbor, N. Y.
Gilman Arthur Drew . . . . . Woods Hole
Otto Knut Olof Folin . . . . . Brookline
Alexander Forbes . . . . . Milton
Samuel Henshaw . . . . . Cambridge
Leland Ossian Howard . . . . . Washington, D. C.
Herbert Spencer Jennings . . . . . Baltimore, Md.
Charles Willison Johnson . . . . . Brookline
Charles Atwood Kofoid . . . . . Berkeley, Cal.
Frederic Thomas Lewis . . . . . Waban
Ralph Stayner Lillie . . . . . Worcester

Jacques Loeb . . . . . New York, N. Y.
Franklin Paine Mall . . . . . Baltimore, Md.
Edward Laurens Mark . . . . . Cambridge
Ernest Gale Martin . . . . . Palo Alto, Cal.
Albert Davis Mead . . . . . Providence, R. I.
Edward Sylvester Morse . . . . . Salem
Herbert Vincent Neal . . . . . Tufts College
Henry Fairfield Osborn . . . . . New York, N. Y.
George Howard Parker . . . . . Cambridge
John Charles Phillips . . . . . Wenham
James Jackson Putnam . . . . . Boston
Herbert Wilbur Rand . . . . . Cambridge
William Emerson Ritter . . . . . La Jolla, Cal.
William Thompson Sedgwick . . . . . Boston
Percy Goldthwait Stiles . . . . . Newtonville
John Eliot Thayer . . . . . Lancaster
Addison Emory Verrill . . . . . New Haven, Conn.
Arthur Wisswald Weysse . . . . . Boston
William Morton Wheeler . . . . . Boston
Harris Hawthorne Wilder . . . . . Northampton
Edmund Beecher Wilson . . . . . New York, N. Y.
Frederick Adams Woods . . . . . Brookline
Robert Mearns Yerkes . . . . . Cambridge

CLASS II., SECTION IV.— *Medicine and Surgery.*— 31.

Edward Hickling Bradford . . . . . Boston
Henry Asbury Christian . . . . . Boston
Harvey Cushing . . . . . Boston
David Linn Edsall . . . . . Boston
Harold Clarence Ernst . . . . . Jamaica Plain
Simon Flexner . . . . . New York, N. Y.
William Stewart Halsted . . . . . Baltimore, Md.
Reid Hunt . . . . . Brookline
Abraham Jacobi . . . . . New York, N. Y.
Elliott Proctor Joslin . . . . . Boston
William Williams Keen . . . . . Philadelphia, Pa.
Frank Burr Mallory. . . . . Brookline
Samuel Jason Mixter . . . . . Boston
Edward Hall Nichols . . . . . Boston
Sir William Osler . . . . . Oxford, Eng.
Theophil Mitchell Prudden . . . . . New York, N. Y.

William Lambert Richardson . . . . . Boston
Milton Joseph Rosenau . . . . . Boston
Frederick Cheever Shattuck . . . . . Boston
Theobald Smith . . . . . Princeton, N. J.
Elmer Ernest Southard . . . . . Boston
Richard Pearson Strong . . . . . Boston
Ernest Edward Tyzzer . . . . . Boston
Frederick Herman Verhoeff . . . . . Boston
Henry Pickering Walcott . . . . . Cambridge
John Collins Warren . . . . . Boston
William Henry Welch . . . . . Baltimore, Md.
Francis Henry Williams . . . . . Boston
Simeon Burt Wolbach . . . . . Boston
Horatio Curtis Wood . . . . . Philadelphia, Pa.
James Homer Wright . . . . . Boston

CLASS III.— *Moral and Political Sciences.*— 153.

SECTION 1.— *Theology, Philosophy and Jurisprudence.*— 40.

Simeon Eben Baldwin . . . . . New Haven, Conn.
Joseph Henry Beale . . . . . Cambridge
Melville Madison Bigelow . . . . . Cambridge
James De Normandie . . . . . Roxbury
Frederic Dodge . . . . . Belmont
Edward Staples Drown . . . . . Cambridge
William Harrison Dunbar . . . . . Cambridge
Timothy Dwight . . . . . New Haven, Conn.
William Wallace Fenn . . . . . Cambridge
Frederick Perry Fish . . . . . Brookline
Frederick John Foakes-Jackson . . . . . New York, N. Y.
George Angier Gordon . . . . . Boston
John Wilkes Hammond . . . . . Cambridge
Alfred Hemenway . . . . . Boston
Marcus Perrin Knowlton . . . . . Springfield
William Lawrence . . . . . Boston
George Vasmer Leverett . . . . . Boston
Arthur Lord . . . . . Plymouth
William Caleb Loring . . . . . Boston
Nathan Matthews . . . . . Boston
Samuel Walker McCall . . . . . Winchester
Edward Caldwell Moore . . . . . Cambridge

George Herbert Palmer . . . . . Cambridge
Charles Edwards Park . . . . . Boston
George Wharton Pepper . . . . . Philadelphia, Pa.
John Winthrop Platner . . . . . Cambridge
Roscoe Pound . . . . . Belmont
Elihu Root . . . . . New York, N. Y.
James Hardy Ropes . . . . . Cambridge
Arthur Prentice Rugg . . . . . Worcester
Henry Newton Sheldon . . . . . Boston
Moorfield Storey . . . . . Boston
William Howard Taft . . . . . New Haven, Conn.
William Jewett Tucker . . . . . Hanover, N. H.
William Cushing Wait . . . . . Medford
Williston Walker . . . . . New Haven, Conn.
Eugene Wambaugh . . . . . Cambridge
Edward Henry Warren . . . . . Boston
Samuel Williston . . . . . Belmont
Woodrow Wilson . . . . . Washington, D. C.

CLASS III., SECTION II.— *Philology and Archæology.*— 45.

Francis Greenleaf Allinson . . . . . Providence, R. I.
William Rosenzweig Arnold . . . . . Cambridge
Maurice Bloomfield . . . . . Baltimore, Md.
Franz Boas . . . . . New York, N. Y.
Charles Pickering Bowditch . . . . . Jamaica Plain
Franklin Carter . . . . . Williamstown
George Henry Chase . . . . . Cambridge
Roland Burrage Dixon . . . . . Cambridge
William Curtis Farabee . . . . . Cambridge
Jesse Walter Fewkes . . . . . Washington, D. C.
Jeremiah Denis Mathias Ford . . . . . Cambridge
Basil Lanneau Gildersleeve . . . . . Baltimore, Md.
Charles Hall Grandgent . . . . . Cambridge
Louis Herbert Gray . . . . . Boston
Charles Burton Gulick . . . . . Cambridge
William Arthur Heidel . . . . . Middletown, Conn.
Bert Hodge Hill . . . . . Athens, Greece
Edward Washburn Hopkins . . . . . New Haven, Conn.
Joseph Clark Hoppin . . . . . Boston
Albert Andrew Howard . . . . . Cambridge
William Guild Howard . . . . . Cambridge

Aleš Hrdlička . . . . . Washington, D. C.
Carl Newell Jackson . . . . . Cambridge
Hans Carl Gunther von Jagemann . . . . . Cambridge
James Richard Jewett . . . . . Cambridge
Alfred Louis Kroeber . . . . . Berkeley, Cal.
Kirsopp Lake . . . . . Cambridge
Henry Roseman Lang . . . . . New Haven, Conn.
Charles Rockwell Lanman . . . . . Cambridge
David Gordon Lyon . . . . . Cambridge
Clifford Herschel Moore . . . . . Cambridge
George Foot Moore . . . . . Cambridge
Hanns Oertel . . . . . New Haven, Conn.
Bernadotte Perrin . . . . . New Haven, Conn.
Edward Kennard Rand . . . . . Cambridge
George Andrew Reisner . . . . . Cambridge
Edward Robinson . . . . . New York, N. Y.
Fred Norris Robinson . . . . . Cambridge
Edward Stevens Sheldon . . . . . Cambridge
Herbert Weir Smyth . . . . . Cambridge
Franklin Bache Stephenson . . . . . Claremont, Cal.
Charles Cutler Torrey . . . . . New Haven, Conn.
Alfred Marston Tozzer . . . . . Cambridge
Andrew Dickson White . . . . . Ithaca, N. Y.
James Haughton Woods . . . . . Cambridge

CLASS III., SECTION III.— *Political Economy and History.*— 34.

Henry Adams . . . . . Washington, D. C.
Charles Jesse Bullock . . . . . Cambridge
Thomas Nixon Carver . . . . . Cambridge
John Bates Clark . . . . . New York
Archibald Cary Coolidge . . . . . Boston
Richard Henry Dana . . . . . Cambridge
Andrew McFarland Davis . . . . . Cambridge
Davis Rich Dewey . . . . . Cambridge
Edward Bangs Drew . . . . . Cambridge
Ephraim Emerton . . . . . Cambridge
Henry Walcott Farnam . . . . . New Haven, Conn.
Irving Fisher . . . . . New Haven, Conn.
Worthington Chauncey Ford. . . . . Cambridge
Edwin Francis Gay . . . . . Cambridge
Frank Johnson Goodnow . . . . . Baltimore, Md.

Arthur Twining Hadley . . . . . New Haven, Conn.
Albert Bushnell Hart . . . . . Cambridge
Charles Homer Haskins . . . . . Cambridge
Henry Cabot Lodge . . . . . Nahant
Abbott Lawrence Lowell . . . . . Cambridge
Roger Bigelow Merriman . . . . . Cambridge
Samuel Eliot Morison . . . . . Boston
William Bennett Munro . . . . . Cambridge
James Ford Rhodes . . . . . Boston
William Mulligan Sloane . . . . . New York, N. Y.
Charles Card Smith . . . . . Boston
Henry Morse Stephens . . . . . Berkeley, Cal.
John Osborne Sumner . . . . . Boston
Frank William Taussig . . . . . Cambridge
William Roscoe Thayer . . . . . Cambridge
Frederick Jackson Turner . . . . . Cambridge
Thomas Franklin Waters . . . . . Ipswich
George Grafton Wilson . . . . . Cambridge
George Parker Winship . . . . . Providence, R. I.

Class III., Section IV.— *Literature and the Fine Arts.*— 34.

George Pierce Baker . . . . . Cambridge
Arlo Bates . . . . . Boston
James Phinney Baxter . . . . . Portland, Me.
William Sturgis Bigelow . . . . . Boston
Le Baron Russell Briggs . . . . . Cambridge
Ralph Adams Cram . . . . . Boston
Samuel McChord Crothers . . . . . Cambridge
Wilberforce Eames . . . . . New York, N. Y.
Henry Herbert Edes . . . . . Cambridge
Edward Waldo Emerson . . . . . Concord
Arthur Fairbanks . . . . . Cambridge
Arthur Foote . . . . . Brookline
Kuno Francke . . . . . Cambridge
Daniel Chester French . . . . . Stockbridge
Horace Howard Furness . . . . . Philadelphia, Pa.
Robert Grant . . . . . Boston
Chester Noyes Greenough . . . . . Cambridge
Francis Barton Gummere . . . . . Haverford, Pa.
Henry Lee Higginson . . . . . Boston
James Kendall Hosmer . . . . . Minneapolis, Minn.

Mark Antony DeWolfe Howe . . . . . Boston
George Lyman Kittredge . . . . . Cambridge
William Coolidge Lane . . . . . Cambridge
Allan Marquand . . . . . Princeton, N. J.
Albert Matthews . . . . . Boston
William Allan Neilson . . . . . Cambridge
Herbert Putnam . . . . . Washington, D. C.
Denman Waldo Ross . . . . . Cambridge
John Singer Sargent . . . . . London, Eng.
Ellery Sedgwick . . . . . Boston
Richard Clipston Sturgis . . . . . Boston
Barrett Wendell . . . . . Boston
Owen Wister . . . . . Philadelphia, Pa.
George Edward Woodberry . . . . . Beverly

FOREIGN HONORARY MEMBERS.— 64.

(Number limited to seventy-five).

Class I.— *Mathematical and Physical Sciences.*— 22.

Section I.— *Mathematics and Astronomy.*— 6.

Johann Oskar Backlund	Petrograd
Felix Klein	Göttingen
Tullio Levi-Civita	Padua
Sir Joseph Norman Lockyer	London
Émile Picard	Paris
Charles Jean de la Vallée Poussin	Louvain

Class I., Section II.— *Physics.*— 9.

Svante August Arrhenius	Stockholm
Oliver Heaviside	Torquay
Sir Joseph Larmor	Cambridge
Hendrik Antoon Lorentz	Leyden
Max Planck	Berlin
Augusto Righi	Bologna
Sir Ernest Rutherford	Manchester
John William Strutt, Baron Rayleigh	Witham
Sir Joseph John Thomson	Cambridge

Class I., Section III.— *Chemistry.*— 4.

Adolf, Ritter von Baeyer	Munich
Emil Fischer	Berlin
Fritz Haber	Berlin
Wilhelm Ostwald	Leipsic

CLASS I.— SECTION IV.— *Technology and Engineering.*— 3.

Heinrich Müller Breslau . . . . . Berlin
Vsevolod Jevgenjevic Timonoff . . . . . Petrograd
William Cawthorne Unwin . . . . . London

CLASS II.— *Natural and Physiological Sciences.*— 18.

SECTION I.— *Geology, Mineralogy, and Physics of the Globe.*— 7.

Frank Dawson Adams . . . . . Montreal
Waldemar Christofer Brögger . . . . . Christiania
Sir Archibald Geikie . . . . . Haslemere, Surrey
Viktor Goldschmidt . . . . . Heidelberg
Julius Hann . . . . . Vienna
Albert Heim . . . . . Zürich
Johan Herman Lie Vogt . . . . . Trondhjem

CLASS II., SECTION II.— *Botany.*— 6.

John Briquet . . . . . Geneva
Adolf Engler . . . . . Berlin
Wilhelm Pfeffer . . . . . Leipsic
Hermann, Graf zu Solms-Laubach . . . . . Strassburg
Ignatz Urban . . . . . Berlin
Eugene Warming . . . . . Copenhagen

CLASS II.— SECTION III.—*Zoölogy and Physiology.*— 2.

Sir Edwin Ray Lankester . . . . . London
Magnus Gustav Retzius . . . . . Stockholm

CLASS II., SECTION IV.— *Medicine and Surgery.*— 3.

Emil von Behring . . . . . Marburg
Angelo Celli . . . . . Rome
Adam Politzer . . . . . Vienna

Class III.— *Moral and Political Sciences.*— 24.

Section I.— *Theology, Philosophy and Jurisprudence.*— 4.

Arthur James Balfour	Prestonkirk
Heinrich Brunner	Berlin
Albert Venn Dicey	Oxford
Sir Frederick Pollock, Bart	London

Section II.— *Philology and Archæology.*— 8.

Friedrich Delitzsch	Berlin
Hermann Diels	Berlin
Wilhelm Dörpfeld	Athens
Henry Jackson	Cambridge
Hermann Georg Jacobi	Bonn
Sir Gaston Camille Charles Maspero	Paris
Alfred Percival Maudslay	Hereford
Eduard Seler	Berlin

Section III.— *Political Economy and History.*— 6.

Viscount Bryce	London
Adolf Harnack	Berlin
Alfred Marshall	Cambridge
John Morley, Viscount Morley of Blackburn	London.
Sir George Otto Trevelyan, Bart.	London
Pasquale Villari	Florence

Section IV.— *Literature and the Fine Arts.*— 6.

Georg Brandes	Copenhagen
Thomas Hardy	Dorchester
Jean Adrien Aubin Jules Jusserand	Paris
Rudyard Kipling	Burwash
Sir Sidney Lee	London
Sir James Augustus Henry Murray	Oxford

STATUTES AND STANDING VOTES

STATUTES

Adopted November 8, 1911: *amended May* 8, 1912, *January* 8, *and May* 14, 1913, *April* 14, 1915, *April* 12, 1916.

CHAPTER I

The Corporate Seal

Article 1. The Corporate Seal of the Academy shall be as here depicted:

Article 2. The Recording Secretary shall have the custody of the Corporate Seal.

See Chap. v. art. 3; chap. vi. art. 2.

CHAPTER II

Fellows and Foreign Honorary Members and Dues

Article 1. The Academy consists of Fellows, who are either citizens or residents of the United States of America, and Foreign Honorary Members. They are arranged in three Classes, according to the Arts and Sciences in which they are severally proficient, and each Class is divided into four Sections, namely:

Class I. *The Mathematical and Physical Sciences*
- Section 1. Mathematics and Astronomy
- Section 2. Physics
- Section 3. Chemistry
- Section 4. Technology and Engineering

Class II. *The Natural and Physiological Sciences*
- Section 1. Geology, Mineralogy, and Physics of the Globe
- Section 2. Botany
- Section 3. Zoölogy and Physiology
- Section 4. Medicine and Surgery

Class III. *The Moral and Political Sciences*
- Section 1. Theology, Philosophy, and Jurisprudence
- Section 2. Philology and Archaeology
- Section 3. Political Economy and History
- Section 4. Literature and the Fine Arts

Article 2. The number of Fellows shall not exceed Six hundred, of whom not more than Four hundred shall be residents of Massachusetts, nor shall there be more than Two hundred in any one Class.

Article 3. The number of Foreign Honorary Members shall not exceed Seventy-five. They shall be chosen from among citizens of foreign countries most eminent for their discoveries and attainments in any of the Classes above enumerated. There shall not be more than Twenty-five in any one Class.

Article 4. If any person, after being notified of his election as Fellow, shall neglect for six months to accept in writing and to pay his Admission Fee (unless he be absent from the Commonwealth at the time of his notification) his election shall be void; and if any Fellow resident within fifty miles of Boston shall neglect to pay his Annual Dues for six months after they are due, provided his attention shall have been called to this Article of the Statutes in the meantime,

he shall cease to be a Fellow; but the Council may suspend the provisions of this Article for a reasonable time.

With the previous consent of the Council, the Treasurer may dispense (*sub silentio*) with the payment of the Admission Fee or of the Annual Dues or both whenever he shall deem it advisable. In the case of officers of the Army or Navy who are out of the Commonwealth on duty, payment of the Annual Dues may be waived during such absence if continued during the whole financial year and if notification of such expected absence be sent to the Treasurer. Upon similar notification to the Treasurer, similar exemption may be accorded to Fellows subject to Annual Dues, who may temporarily remove their residence for at least two years to a place more than fifty miles from Boston.

If any person elected a Foreign Honorary Member shall neglect for six months after being notified of his election to accept in writing, his election shall be void.

See Chap. vii. art. 2.

ARTICLE 5. Every Fellow hereafter elected shall pay an Admission Fee of Ten dollars.

Every Fellow resident within fifty miles of Boston shall, and others may, pay such Annual Dues, not exceeding Fifteen dollars, as shall be voted by the Academy at each Annual Meeting, when they shall become due, except in the case of Fellows elected at the January meetings, who shall be obliged to pay but one half of such Annual Dues in the year in which they are elected; but any Fellow shall be exempt from the annual payment if, at any time after his admission, he shall pay into the treasury Two hundred dollars in addition to his previous payments.

All Commutations of the Annual Dues shall be and remain permanently funded, the interest only to be used for current expenses.

Any Fellow not previously subject to Annual Dues who takes up his residence within fifty miles of Boston, shall pay to the Treasurer within three months thereafter Annual Dues for the current year, failing which his Fellowship shall cease; but the Council may suspend the provisions of this Article for a reasonable time.

Only Fellows who pay Annual Dues or have commuted them may hold office in the Academy or serve on the Standing Committees or vote at meetings.

ARTICLE 6. Fellows who pay or have commuted the Annual Dues and Foreign Honorary Members shall be entitled to receive gratis one copy of all Publications of the Academy issued after their election.

See Chap. x. art. 2.

ARTICLE 7. Diplomas signed by the President and the Vice-President of the Class to which the member belongs, and countersigned by the Secretaries, shall be given to all the Fellows and Foreign Honorary Members.

ARTICLE 8. If, in the opinion of a majority of the entire Council, any Fellow or Foreign Honorary Member shall have rendered himself unworthy of a place in the Academy, the Council shall recommend to the Academy the termination of his membership; and if three fourths of the Fellows present, out of a total attendance of not less than fifty, at a Stated Meeting, or at a Special Meeting called for the purpose, shall adopt this recommendation, his name shall be stricken from the Roll.

See Chap. iii.; chap. vi. art. 1; chap. ix. art. 1, 7; chap. x. art. 2.

CHAPTER III

ELECTION OF FELLOWS AND FOREIGN HONORARY MEMBERS

ARTICLE 1. Elections of Fellows and Foreign Honorary Members shall be by ballot, and only at the Stated Meetings in January and May. Three fourths of the ballots cast, and not less than twenty, must be affirmative to effect an election.

ARTICLE 2. Nominations to Fellowship or Foreign Honorary Membership in any Section must be signed by two Fellows in that Section. These nominations shall be sent to the Corresponding Secretary accompanied by statements of qualifications and brief biographical data, and shall be retained by him until the first of the following October or February, as the case may be. All nominations then in his hands shall be sent in printed form to every Fellow having the right to vote, with the names of the proposers in each case, and with a request to send to the Corresponding Secretary written comments on these names not later than the fifth of November or the fifth of March respectively.

All the nominations, with the comments thereon, received up to the fifth of November or the fifth of March shall be referred at once to the appropriate Class Committees, which shall report their decisions to the Council at a special meeting to be called to consider nominations, not later than two days before the meeting of the Academy in December or April respectively.

Notice shall be sent to every Fellow having the right to vote, not later than the fifteenth of September or January, of each year, calling

attention to the fact that the limit of time for sending nominations to the Corresponding Secretary will expire on the first of the following month.

ARTICLE 3. Not later then the fourth Wednesday of December and April, the Corresponding Secretary shall send in print to every Fellow having the right to vote all nominations that have been approved by the Council, with a brief account of each nominee.

See Chap. ii.; chap. vi. art. 1; chap. ix. art. 1.

CHAPTER IV

OFFICERS

ARTICLE 1. The Officers of the Academy shall be a President (who shall be Chairman of the Council), three Vice-Presidents (one from each Class), a Corresponding Secretary (who shall be Secretary of the Council), a Recording Secretary, a Treasurer, and a Librarian, all of whom shall be elected by ballot at the Annual Meeting, and shall hold their respective offices for one year, and until others are duly chosen and installed.

There shall be also twelve Councillors, one from each Section of each Class. At each Annual Meeting three Councillors, one from each Class, shall be elected by ballot to serve for the full term of four years and until others are duly chosen and installed. The same Fellow shall not be eligible for two successive terms.

The Councillors, with the other officers previously named, and the Chairman of the House Committee, *ex officio*, shall constitute the Council.

See Chap. x. art. 1.

ARTICLE 2. If any office shall become vacant during the year, the vacancy may be filled by the Council in its discretion for the unexpired term.

ARTICLE 3. At the Stated Meeting in March, the President shall appoint a Nominating Committee of three Fellows having the right to vote, one from each Class. This Committee shall prepare a list of nominees for the several offices to be filled, and for the Standing Committees, and file it with the Recording Secretary not later than four weeks before the Annual Meeting.

See Chap. vi. art. 2.

ARTICLE 4. Independent nominations for any office, if signed by at least twenty Fellows having the right to vote, and received by the Recording Secretary not less than ten days before the Annual Meeting, shall be inserted in the call therefor, and shall be mailed to all the Fellows having the right to vote.

See Chap. vi. art. 2.

ARTICLE 5. The Recording Secretary shall prepare for use in voting at the Annual Meeting a ballot containing the names of all persons duly nominated for office.

CHAPTER V

THE PRESIDENT

ARTICLE 1. The President, or in his absence the senior Vice-President present (seniority to be determined by length of continuous fellowship in the Academy), shall preside at all meetings of the Academy. In the absence of all these officers, a Chairman of the meeting shall be chosen by ballot.

ARTICLE 2. Unless otherwise ordered, all Committees which are not elected by ballot shall be appointed by the presiding officer.

ARTICLE 3. Any deed or writing to which the Corporate Seal is to be affixed, except leases of real estate, shall be executed in the name of the Academy by the President or, in the event of his death, absence, or inability, by one of the Vice-Presidents, when thereto duly authorized.

See Chap. ii. art. 7; chap. iv. art. 1, 3; chap. vi. art. 2; chap. vii. art. 1; chap. ix. art. 6; chap. x. art. 1; 2; chap. xi. art. 1.

CHAPTER VI

THE SECRETARIES

ARTICLE 1. The Corresponding Secretary shall conduct the correspondence of the Academy and of the Council, recording or making an entry of all letters written in its name, and preserving for the files all official papers which may be received. At each meeting of the Council he shall present the communications addressed to the Academy which have been received since the previous meeting, and at the next meeting of the Academy he shall present such as the Council may determine.

He shall notify all persons who may be elected Fellows or Foreign Honorary Members, send to each a copy of the Statutes, and on their acceptance issue the proper Diploma. He shall also notify all meetings of the Council; and in case of the death, absence, or inability of the Recording Secretary he shall notify all meetings of the Academy.

Under the direction of the Council, he shall keep a List of the Fellows and Foreign Honorary Members, arranged in their several Classes and Sections. It shall be printed annually and issued as of the first day of July.

See Chap. ii. art. 7; chap. iii. art. 2, 3; chap. iv. art. 1; chap. ix. art. 6; chap. x. art. 1; chap. xi. art. 1.

ARTICLE 2. The Recording Secretary shall have the custody of the Charter, Corporate Seal, Archives, Statute-Book, Journals, and all literary papers belonging to the Academy.

Fellows borrowing such papers or documents shall receipt for them to their custodian.

The Recording Secretary shall attend the meetings of the Academy and keep a faithful record of the proceedings with the names of the Fellows present; and after each meeting is duly opened, he shall read the record of the preceding meeting.

He shall notify the meetings of the Academy to each Fellow by mail at least seven days beforehand, and in his discretion may also cause the meetings to be advertised; he shall apprise Officers and Committees of their election or appointment, and inform the Treasurer of appropriations of money voted by the Academy.

After all elections, he shall insert in the Records the names of the Fellows by whom the successful nominees were proposed.

He shall send the Report of the Nominating Committee in print to every Fellow having the right to vote at least three weeks before the Annual Meeting.

See Chap. iv. art. 3.

In the absence of the President and of the Vice-Presidents he shall, if present, call the meeting to order, and preside until a Chairman is chosen.

See Chap. i.; chap. ii. art. 7; chap. iv. art. 3, 4, 5; chap. ix. art. 6; chap. x. art. 1, 2; chap. xi. art. 1, 3.

ARTICLE 3. The Secretaries, with the Chairman of the Committee of Publication, shall have authority to publish such of the records of the meetings of the Academy as may seem to them likely to promote its interests.

CHAPTER VII

The Treasurer and the Treasury

Article 1. The Treasurer shall collect all money due or payable to the Academy, and all gifts and bequests made to it. He shall pay all bills due by the Academy, when approved by the proper officers, except those of the Treasurer's office, which may be paid without such approval; in the name of the Academy he shall sign all leases of real estate; and, with the written consent of a member of the Committee on Finance, he shall make all transfers of stocks, bonds, and other securities belonging to the Academy, all of which shall be in his official custody.

He shall keep a faithful account of all receipts and expenditures, submit his accounts annually to the Auditing Committee, and render them at the expiration of his term of office, or whenever required to do so by the Academy or the Council.

He shall keep separate accounts of the income of the Rumford Fund, and of all other special Funds, and of the appropriation thereof, and render them annually.

His accounts shall always be open to the inspection of the Council.

Article 2. He shall report annually to the Council at its March meeting on the expected income of the various Funds and from all other sources during the ensuing financial year. He shall also report the names of all Fellows who may be then delinquent in the payment of their Annual Dues.

Article 3. He shall give such security for the trust reposed in him as the Academy may require.

Article 4. With the approval of a majority of the Committee on Finance, he may appoint an Assistant Treasurer to perform his duties, for whose acts, as such assistant, he shall be responsible; or, with like approval and responsibility, he may employ any Trust Company doing business in Boston as his agent for the same purpose, the compensation of such Assistant Treasurer or agent to be fixed by the Committee on Finance and paid from the funds of the Academy.

Article 5. At the Annual Meeting he shall report in print all his official doings for the preceding year, stating the amount and condition

of all the property of the Academy entrusted to him, and the character of the investments.

ARTICLE 6. The Financial Year of the Academy shall begin with the first day of April.

ARTICLE 7. No person or committee shall incur any debt or liability in the name of the Academy, unless in accordance with a previous vote and appropriation therefor by the Academy or the Council, or sell or otherwise dispose of any property of the Academy, except cash or invested funds, without the previous consent and approval of the Council.

See Chap. ii. art. 4, 5; chap. vi. art. 2; chap ix. art. 6; chap. x. art. 1, 2, 3; chap. xi. art. 1.

CHAPTER VIII

THE LIBRARIAN AND THE LIBRARY

ARTICLE 1. The Librarian shall have charge of the printed books, keep a correct catalogue thereof, and provide for their delivery from the Library.

At the Annual Meeting, as Chairman of the Committee on the Library, he shall make a Report on its condition.

ARTICLE 2. In conjunction with the Committee on the Library he shall have authority to expend such sums as may be appropriated by the Academy for the purchase of books, periodicals, etc., and for defraying other necessary expenses connected with the Library.

ARTICLE 3. All books procured from the income of the Rumford Fund or of other special Funds shall contain a book-plate expressing the fact.

ARTICLE 4. Books taken from the Library shall be receipted for to the Librarian or his assistant.

ARTICLE 5. Books shall be returned in good order, regard being had to necessary wear with good usage. If any book shall be lost or injured, the Fellow to whom it stands charged shall replace it by a new volume or by a new set, if it belongs to a set, or pay the current price thereof to the Librarian, whereupon the remainder of the set, if any,

shall be delivered to the Fellow so paying, unless such remainder be valuable by reason of association.

ARTICLE 6. All books shall be returned to the Library for examination at least one week before the Annual Meeting.

ARTICLE 7. The Librarian shall have the custody of the Publications of the Academy. With the advice and consent of the President, he may effect exchanges with other associations.

See Chap. ii. art. 6; chap. x. art. 1, 2.

CHAPTER IX

THE COUNCIL

ARTICLE 1. The Council shall exercise a discreet supervision over all nominations and elections to membership, and in general supervise all the affairs of the Academy not explicitly reserved to the Academy as a whole or entrusted by it or by the Statutes to standing or special committees.

It shall consider all nominations duly sent to it by any Class Committee, and present to the Academy for action such of these nominations as it may approve by a majority vote of the members present at a meeting, of whom not less than seven shall have voted in the affirmative.

With the consent of the Fellow interested, it shall have power to make transfers between the several Sections of the same Class, reporting its action to the Academy.

See Chap. iii. art. 2, 3; chap. x. art. 1.

ARTICLE 2. Seven members shall constitute a quorum.

ARTICLE 3. It shall establish rules and regulations for the transaction of its business, and provide all printed and engraved blanks and books of record.

ARTICLE 4. It shall act upon all resignations of officers, and all resignations and forfeitures of Fellowship; and cause the Statutes to be faithfully executed.

It shall appoint all agents and subordinates not otherwise provided for by the Statutes, prescribe their duties, and fix their compensation.

They shall hold their respective positions during the pleasure of the Council.

ARTICLE 5. It may appoint, for terms not exceeding one year, and prescribe the functions of, such committees of its number, or of the Fellows of the Academy, as it may deem expedient, to facilitate the administration of the affairs of the Academy or to promote its interests.

ARTICLE 6. At its March meeting it shall receive reports from the President, the Secretaries, the Treasurer, and the Standing Committees, on the appropriations severally needed for the ensuing financial year. At the same meeting the Treasurer shall report on the expected income of the various Funds and from all other sources during the same year.

A report from the Council shall be submitted to the Academy, for action, at the March meeting, recommending the appropriation which in the opinion of the Council should be made.

On the recommendation of the Council, special appropriations may be made at any Stated Meeting of the Academy, or at a Special Meeting called for the purpose.

See Chap. x. art. 3.

ARTICLE 7. After the death of a Fellow or Foreign Honorary Member, it shall appoint a member of the Academy to prepare a Memoir for publication in the Proceedings.

ARTICLE 8. It shall report at every meeting of the Academy such business as it may deem advisable to present.

See Chap. ii. art. 4, 5, 8; chap. iv. art. 1, 2; chap. vi. art. 1; chap. vii. art. 1; chap. xi. art. 1, 4.

CHAPTER X

STANDING COMMITTEES

ARTICLE 1. The Class Committee of each Class shall consist of the Vice-President, who shall be chairman, and the four Councillors of the Class, together with such other officer or officers annually elected as may belong to the Class. It shall consider nominations to Fellowship in its own Class, and report in writing to the Council such as may receive at a Class Committee Meeting a majority of the votes cast, provided at least three shall have been in the affirmative.

See Chap. iii. art. 2.

ARTICLE 2. At the Annual Meeting the following Standing Committees shall be elected by ballot to serve for the ensuing year:

(i) *The Committee on Finance,* to consist of three Fellows, who, through the Treasurer, shall have full control and management of the funds and trusts of the Academy, with the power of investing the funds and of changing the investments thereof in their discretion.

See Chap. iv. art. 3; chap. vii. art. 1, 4; chap. ix. art. 6.

(ii) *The Rumford Committee,* to consist of seven Fellows, who shall report to the Academy on all applications and claims for the Rumford Premium. It alone shall authorize the purchase of books publications and apparatus at the charge of the income from the Rumford Fund, and generally shall see to the proper execution of the trust.

See Chap. iv. art. 3; chap. ix. art. 6.

(iii) *The Cyrus Moors Warren Committee,* to consist of seven Fellows, who shall consider all applications for appropriations from the income of the Cyrus Moors Warren Fund, and generally shall see to the proper execution of the trust.

See Chap. iv. art. 3; chap. ix. art. 6.

(iv) *The Committee of Publication,* to consist of three Fellows, one from each Class, to whom all communications submitted to the Academy for publication shall be referred, and to whom the printing of the Proceedings and the Memoirs shall be entrusted.

It shall fix the price at which the Publications shall be sold; but Fellows may be supplied at half price with volumes which may be needed to complete their sets, but which they are not entitled to receive gratis.

Two hundred extra copies of each paper accepted for publication in the Proceedings or the Memoirs shall be placed at the disposal of the author without charge.

See Chap. iv. art. 3; chap. vi. art. 1, 3; chap. ix. art. 6.

(v) *The Committee on the Library,* to consist of the Librarian, *ex officio,* as Chairman, and three other Fellows, one from each Class, who shall examine the Library and make an annual report on its condition and management.

See Chap. iv. art. 3; chap. viii. art. 1, 2; chap. ix. art. 6.

(vi) *The House Committee,* to consist of three Fellows, who shall have charge of all expenses connected with the House, including the general expenses of the Academy not specifically assigned to the care of other Committees or Officers.

See Chap. iv. art. 1, 3; chap. ix. art. 6.

(vii) *The Committee on Meetings,* to consist of the President, the Recording Secretary, and three other Fellows, who shall have charge of plans for meetings of the Academy.

See Chap. iv. art. 3; chap. ix. art. 6.

(viii) *The Auditing Committee,* to consist of two Fellows, who shall audit the accounts of the Treasurer, with power to employ an expert and to approve his bill.

See Chap. iv. art. 3; chap. vii. art. 1; chap. ix. art. 6.

ARTICLE 3. The Standing Committees shall report annually to the Council in March on the appropriations severally needed for the ensuing financial year; and all bills incurred on account of these Committees, within the limits of the several appropriations made by the Academy, shall be approved by their respective Chairmen.

In the absence of the Chairman of any Committee, bills may be approved by any member of the Committee whom he shall designate for the purpose.

See Chap. vii. art. 1, 7; chap. ix. art. 6.

CHAPTER XI

MEETINGS, COMMUNICATIONS, AND AMENDMENTS

ARTICLE 1. There shall be annually eight Stated Meetings of the Academy, namely, on the second Wednesday of October, November, December, January, February, March, April and May. Only at these meetings, or at adjournments thereof regularly notified, or at Special Meetings called for the purpose, shall appropriations of money be made or amendments of the Statutes or Standing Votes be effected.

The Stated Meeting in May shall be the Annual Meeting of the Corporation.

Special Meetings shall be called by either of the Secretaries at the request of the President, of a Vice-President, of the Council, or of ten

Fellows having the right to vote; and notifications thereof shall state the purpose for which the meeting is called.

A meeting for receiving and discussing literary or scientific communications may be held on the fourth Wednesday of each month, excepting July, August, and September; but no business shall be transacted at said meetings.

ARTICLE 2. Twenty Fellows having the right to vote shall constitute a quorum for the transaction of business at Stated or Special Meetings. Fifteen Fellows shall be sufficient to constitute a meeting for literary or scientific communications and discussions.

ARTICLE 3. Upon the request of the presiding officer or the Recording Secretary, any motion or resolution offered at any meeting shall be submitted in writing.

ARTICLE 4. No report of any paper presented at a meeting of the Academy shall be published by any Fellow without the consent of the author; and no report shall in any case be published by any Fellow in a newspaper as an account of the proceedings of the Academy without the previous consent and approval of the Council. The Council, in its discretion, by a duly recorded vote, may delegate its authority in this regard to one or more of its members.

ARTICLE 5. No Fellow shall introduce a guest at any meeting of the Academy until after the business has been transacted, and especially until after the result of the balloting upon nominations has been declared.

ARTICLE 6. The Academy shall not express its judgment on literary or scientific memoirs or performances submitted to it, or included in its Publications.

ARTICLE 7. All proposed Amendments of the Statutes shall be referred to a committee, and on its report, at a subsequent Stated Meeting or at a Special Meeting called for the purpose, two thirds of the ballot cast, and not less than twenty, must be affirmative to effect enactment.

ARTICLE 8. Standing Votes may be passed, amended, or rescinded at a Stated Meeting, or at a Special Meeting called for the purpose, by a vote of two thirds of the members present. They may be suspended by a unanimous vote.

See Chap. ii. art. 5, 8; chap. iii.; chap. iv. art. 3, 4, 5; chap v. art. 1; chap. vi. art. 1, 2; chap. ix. art. 8.

STANDING VOTES

1. Communications of which notice has been given to either of the Secretaries shall take precedence of those not so notified.

2. Fellows may take from the Library six volumes at any one time, and may retain them for three months, and no longer. Upon special application, and for adequate reasons assigned, the Librarian may permit a larger number of volumes, not exceeding twelve, to be drawn from the Library for a limited period.

3. Works published in numbers, when unbound, shall not be taken from the Hall of the Academy without the leave of the Librarian.

4. There may be chosen by the Academy, under the same rules by which Fellows are now chosen, one hundred Resident Associates. Not more than forty Resident Associates shall be chosen in any one Class.

The election of Resident Associates shall be for a term of three years with eligibility for reëlection.

Resident Associates shall be entitled to the same privileges as Fellows, in the use of the Academy building, may attend meetings and present papers, but they shall not have the right to vote. They shall pay no Admission Fee, and their Annual Dues shall be one-half that of Fellows residing within fifty miles of Boston.

The Council and Committees of the Academy may ask one or more Resident Associates to act with them in an advisory or assistant capacity.

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In conformity with the terms of the gift of Sir Benjamin Thompson, Count Rumford, of a certain Fund to the American Academy of Arts and Sciences, and with a decree of the Supreme Judicial Court of Massachusetts for carrying into effect the general charitable intent and purpose of Count Rumford, as expressed in his letter of gift, the Academy is empowered to make from the income of the Rumford Fund, as it now exists, at any Annual Meeting, an award of a gold and a silver medal, being together of the intrinsic value of three hundred dollars,

as a Premium to the author of any important discovery or useful improvement in light or heat, which shall have been made and published by printing, or in any way made known to the public, in any part of the continent of America, or any of the American Islands; preference always being given to such discoveries as, in the opinion of the Academy, shall tend most to promote the good of mankind; and, if the Academy sees fit, to add to such medals, as a further Premium for such discovery and improvement, a sum of money not exceeding three hundred dollars.

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